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Morgan Hebard
Curator of Entomology, Academy of Natural Sciences, Philadelphia

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MORGAN HEBARD

This is the sixth report on the Orthoptera of the States and Provinces, which in part include the Great Plains, those previously published having had to deal with South Dakota, Montana, Colorado, Alberta, and Kansas. Of recent years T. H. Hubbell has also published an important paper on North Dakota and a valuable list and records of species known from Oklahoma.

Lugger's "Orthoptera of Minnesota,"[1] published in 1898, was very complete, but much change in nomenclature has since then occurred. Only in the Locustidae (= Tettigoniidae) were sections of that work either misleading or incorrect.

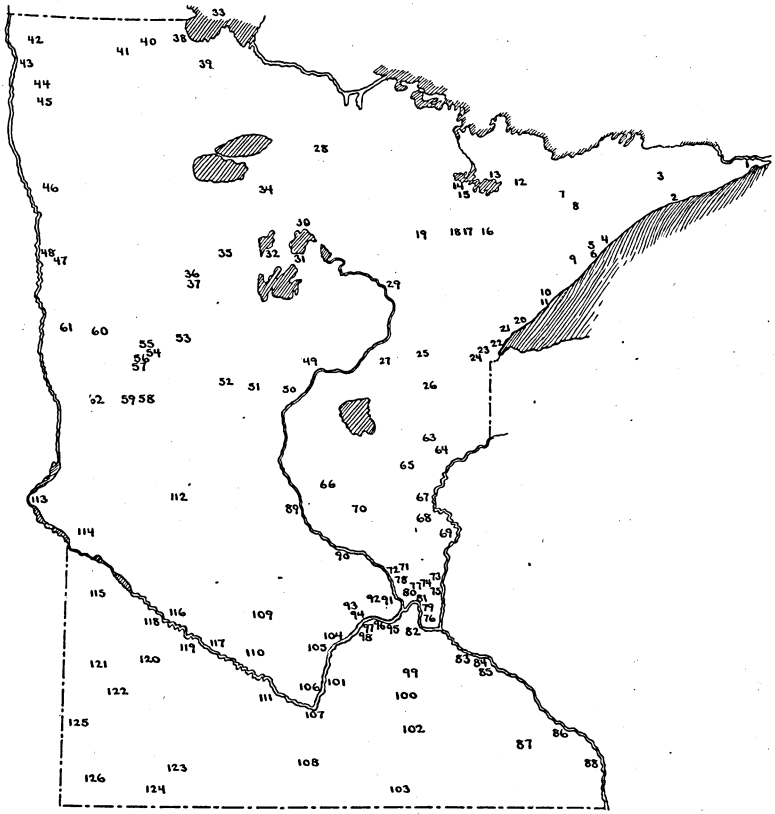
Somes' "Acrididae of Minnesota,"[2] published in 1914, unfortunately showed only minor progress and included not only the few errors made by Lugger in this family but also a number of additional mistakes plainly due to inexperience. That author also published notes on "The Phasmidae of Minnesota, Iowa and Missouri,"[3] in 1916.

Having ourselves collected at only a very few localities in the state, the present work is largely based on the collections of the University of Minnesota, including a large portion of the Lugger collection and extensive series subsequently acquired. We wish to thank most heartily Drs. C. E. Mickel and H. H. Knight for placing that entire collection in our hands for study and for giving us much information necessary to complete our task. Dr. T. H. Frison, of the Illinois State Laboratory of Natural History, has also aided us materially in making it possible for us to examine some of the specimens belonging to the Somes collection, now the property of the Joliet County High School at Joliet, Illinois.

Minnesota is divided into three distinct faunal areas. The northern section, extending across the state to near its western boundary, is boreal, typical of the Canadian Zone, with extensive coniferous forests. A narrow western strip shows a Great Plains element, particularly in its northern portion, probably there due to the avenue afforded by the presence of the valley of the Red River of the North. In the southeastern section the Mississippi brings to that portion of the state a typical humid Eastern fauna. The area in which the species of the East

[1] Third Ann. Rept. State Expt. Sta., pp. 1 to 296.
[2] Univ. of Minn. Agr. Expt. Sta., Bull 141, pp. 1 to 98.
[3] Ent. News, XXVII, pp. 269-271.

and West intermingle is very extensive, however, many eastern forms crossing the southern portion of the state and finding their western limits in eastern South Dakota, while in sand areas even in the southeastern section western forms are present.



Numerals on the map correspond to localities listed on page 5.

In 1931 a disturbing outbreak of Orthoptera occurred in western Minnesota. We believe that economic loss is more likely to occur in a plains environment than elsewhere. By far the most dangerous form of all is *spretus,* the migratory phase of *Melanoplus mexicanus,* which, after causing unparalleled devastation for a long time, disappeared years ago and has not been seen typical on but few occasions since and then in exceedingly small numbers.

Other species that are more likely to cause serious economic loss are also members of *Melanoplus—differentialis* and *bivittatus.* Serious damage may be done to pastures, particularly in the North, however, by such species as *Chorthippus curtipennis* and *Camnula pellucida.*

LOCALITIES IN MINNESOTA CITED IN THIS PAPER WITH INDICATION OF THEIR FAUNAL RELATIONSHIP

Ada	47	Grand Portage	1	Ottawa	101
Albert Lea	103	Grand Rapids	29	Ottertail County	(56-59)
Allen Junction	16	Granite Falls	118	Owatonna	102
Amboy	108	Gray Cloud Island	81	Pelican Lake	56
Anoka County	(71-72)	Greenbush	41	Pelican Rapids	57
Arco	121	Hallock	42	Pillager	50
Argyle	45	Halstad	48	Pine County	(26, 63-64)
Baptism River	5	Hamline	80	Pipestone	125
Barden	96	Harney	23	Princeton	70
Battle Creek	81	Hawley	60	Ramsey County	(78-81)
Beaver River	9	Henderson	105	Red Rock	81
Beltrami County	(33-35)	Hennepin County	(91-92)	Red Wing	83
Bemidji	35	Heron Lake	123	Redwood Falls	119
Bena	31	Hibbing	19	Rice Creek	71
Big Stone	114	Highwood	79	Robbinsdale	91
Biwabik	17	Hinkley	64	Rock County	126
Black Duck	34	Houston County	(88)	Roseau	40
Blakeley	104	Isabella River	8	Rush City	67
Browns Valley	113	Itaska Park	36	Sacred Heart	116
Burntside Lake	13	Jordan	97	St. Anthony Park	81
Carver	94	Kawishiwi River	7	St. Cloud	89
Carver County	(93-94)	Koochiching County	28	St. Louis County	(12-22)
Cascade River	3	La Crescent	88	St. Paul	81
Cass Lake	32	Lake City	85	St. Peter	106
Chisago County	(67-69)	Lake County	(4-11)	Savage	95
Clear Lake	110	Lake Itaska	37	Shell Lake	53
Clear River	39	Lakeland	75	Staples	51
Cliff	81	Lake Minnetonka	92	Stephen	44
Cloquet	24	Lake of the Woods	33	Stewart	109
Cook County	(1-3)	Lake Winnebigoshish	30	Stillwater	73
Cramer	4	Lawrence	93	Sucker River	20
Crookston	46	Lesueur County	(101)	Taylors Falls	69
Detroit	55	Luverne	126	Teien	43
Duluth	22	McGregor	27	Tower	15
Fairbault	100	Madison	115	Two Harbors	11
Fairview	92	Mahtomedi	74	Virginia	18
Farmington	82	Mankato	107	Vermillion Lake	14
Fergus Falls	59	Maple Plain	92	Waconia	93
Finland	6	Marshall	120	Wadena	52
Florence	122	Marshall County	(45)	Waldo	10
Fort Snelling	81	Minneapolis	91	Wall Lake	58
Foxhome	62	Monticello	90	Warroad	38
Frazee	54	Mora	65	Washington County	(73-76)
French River	21	Morton	117	White Bear Lake	77
Fridley	72	New Brighton	78	Wilkin County	(62)
Friesland	63	Newport	76	Willow River	26
Frontenac	84	New Ulm	111	Winona	86
Gilman	66	Nisswa	49	Winton	12
Glenwood	112	Norman County	(47-48)	Worthington	124
Glyndon	61	North Branch	68	Wright	25
Goodhue County	(83-84)	Northfield	99	Wright County	(90)
Grand Marais	2	Olmsted County	87		

1 to 41 are northeastern, in the northern coniferous forest.

42 to 48 are in the northern portion of the valley of the Red River of the North.

49 to 111 are central eastern and southeastern.

112 to 126 are central western and southwestern.

In analyzing the 124 species and races here discussed, we find that 49 are eastern, 28 are western, 30 (of which 4 are established adventives) occur both east and west, 13 are northern, and 14 are characteristic of the mid-western area of prairies (occurring only between the eastern limits of the Great Plains and the western limits of the definitely humid East). These are distributed as follows:

	Northern	Eastern	Western	East and West	Mid-western
Blattidae	0	2	0	3	0
Mantidae	0	0	0	0	0
Phasmidae	0	1	1	0	0
Acrydiinae	2	5	0	0	1
Acridinae	1	5	3	4	0
Oedipodinae	2	7	5	5	0
Cyrtacanthacrinae	6	9	15	4	0
Phaneropterinae	1	6	0	0	1
Copiphorinae	0	1	0	1	0
Conocephalinae	1	5	1	3	1
Decticinae	0	1	1	0	0
Rhaphidophorinae	0	2	2	1	1
Gryllinae	0	0	0	2	0
Nemobiinae	0	2	0	1	0
Oecanthinae	0	2	0	3	0
Trigonidiinae	0	1	0	0	0
Gryllotalpinae	0	0	0	1	0
Tridactylinae	0	0	0	1	0

A total of over 4,100 specimens of Orthoptera from Minnesota has been studied and is reported on in this paper.

Field work is much needed to determine definitely the range in Minnesota of some species. Indeed, Lugger reported some that have subsequently not been seen and are not represented in his collection from Minnesota, tho generally that collection is in an excellent state of preservation. The greatest difficulty is due to the fact that we are confident some of these do occur in Minnesota, while the reverse is certainly true of others. More field work in central southern Minnesota would also help greatly in defining more exactly the eastern and western limits of several species.

The following key is intended solely as an aid to the student in determining the species of Orthoptera found in Minnesota. No attempt is made to assist in distinguishing other related species not known from that state. Only characters of maximum diagnostic value are given. As most species are subject to some individual variation, any difficult specimen should not be determined from the key alone, but efforts should be made to locate it more safely by recourse to the latest revision of the group to which it belongs. If that can not be done the specimen should be submitted to a specialist.

The use of keys can lead to many incorrect determinations if they are used as if the characters there given are fixed. Fear of their misuse had led us to refrain from publishing keys in most of our studies.

KEY TO THE SPECIES OF ORTHOPTERA OF MINNESOTA

A. Limbs nearly equal in size, the caudal thighs not distinctly enlarged for leaping.
B. Body strongly depressed, broad, often more or less oval in dorsal aspect.
C. Pronotum maculate.
D. General coloration buff, pronotum with two longitudinal brown stripes. (Size small. Organs of flight fully developed in both sexes. Introduced species.).. *Blattella germanica* (Linnaeus)
DD. General coloration brown, pronotum without longitudinal stripes.
E. Size large, over an inch long. General coloration reddish brown, pronotal disk paler with twin large dark suffusions. Organs of flight fully developed in both sexes..... *Periplaneta americana* (Linnaeus)
EE. Size medium. General coloration dark brown, with narrow lateral and cephalic margins of pronotum buffy. Organs of flight fully developed in male, reduced in female..... *Parcoblatta pennsylvanica* (DeGeer)
CC. Pronotum immaculate.
D0. Size medium large. Coloration dark brown in male, very dark brown in female. Tegmina slightly reduced in male, vestigial lateral pads in female. (Introduced species.)..... *Blatta orientalis* Linnaeus
DD0. Size medium small. Coloration buff with a reddish tinge in male, reddish brown in female. Organs of flight fully developed in male, tegmina subquadrate attingent pads in female..... *Parcoblatta virginica* (Brunner)
BB. Body exceedingly elongate and slender.
C1. Cerci of male with a blunt proximo-internal tooth; of female blunter and shorter, less than one-half as long as ultimate tergite..... *Diapheromera femorata* (Say)
CC1. Cerci of male with a slender, acute proximo-internal tooth; of female more acute and elongate, over half as long as the longer ultimate tergite..... *Diapheromera veliei veliei* Walsh
AA. Caudal limbs elongate, their thighs decidedly enlarged for leaping.
B1. Antennae much shorter than body and relatively heavy. Auditory organs latero-proximad on abdomen. Stridulating organs of male, if present, on caudal femora and tegmina. Ovipositor composed of two pairs of short curved pieces with acute tips.
C2. Pronotum covering all or nearly all of abdomen. Pulvilli absent. Cephalic and median tarsi with two joints, caudal tarsi with three joints. (Size small.)
D1. Antennae with 12 to 14 joints. Eyes dorsad, not encroached upon by a convex production of the intervening area.
E. Median carina of pronotum high, cristate; dorsum tectate and longitudinally arched.
F. Size very small. Cristation lower. Fastigium more triangularly produced, projection narrower and longer in lateral aspect..... *Nomotettix parvus* Morse
FF. Size small. Christation higher. Fastigium less produced with sides convex, projection broader and shorter in lateral aspect..... *Nomotettix cristatus cristatus* (Scudder)
EE. Median carina of pronotum low; dorsum not tectate, gently sloping or flat.

F1. Fastigium considerably wider than eye, projecting beyond eyes, angulate, rounded or truncate.

G. Fastigium triangularly produced, with median carina not or scarcely projecting. Antennal joints comparatively stout and caudal femora slender..... *Acrydium granulatum* Kirby

GG. Fastigium with sides convex, with median carina projecting. Antennal joints comparatively slender and caudal femora stout.

H. Fastigium projecting well beyond eyes, with sides convex. Lateral carinae of cephalic portion of pronotum typically parallel.

I. Size larger, form more robust, pronotum often showing a trace of tectation. Fastigium often showing very weak indication of triangular production..... *Acrydium acadicum acadicum* (Scudder)

II. Size smaller, form less robust, pronotum showing no trace of tectation. Fastigium normally showing less production.....*Acrydium ornatum* (Say)

HH. Fastigium projecting but little beyond eyes, nearly truncate. Lateral carinae of cephalic portion of pronotum typically slightly convergent caudad..... *Acrydium arenosum angustum* (Hancock)

FF1. Fastigium narrower; narrower than (male) to very slightly wider than (female) eye, not produced, with cephalic margin concave and median carina slightly projecting.....*Paratettix cucullatus* (Burmeister)

DD1. Antennae with twenty-two joints. Eyes dorsad encroached upon by a convex production of the intervening area. (Tegmina with a minute apical dot of buff) .....*Tettigidea lateralis* (Say)

CC2. Pronotum of normal size, not covering abdomen. Pulvilli present. Tarsi all three-jointed.

D2. Prosternum not spined; flat, convex or with an obtuse tubercle.

E2. Caudal margin of pronotal disk not or but little produced; truncate, convex or very obtusely angulate. Pronotal disk without a high median carina. Face usually retreating and at juncture with fastigium angulate.

F2. Lateral foveolae of vertex not visible from above. (Stridulating organs present on male caudal femora and tegmina.)

G1. Antennae strongly ensiform. (Tegmina with adjacent, regular, longitudinal veins in proximal portion of marginal field. Male subgenital plate nearly twice as long as the preceding sternite.) *Pseudopomala brachyptera* (Scudder)

GG1. Antennae simple, or slightly flattened or clavate, never decidedly ensiform.

H1. Fastigium with surface largely convex, lacking a conspicuous infra-marginal impression.

I1. Lateral carinae of pronotum straight, parallel and elevated; supplementary carinae never developed. Antennae subensiform....*Opeia obscura* (Thomas)

III. Lateral carinae of pronotum moderately angulate-constricted; supplementary carinae often present. Antennae strikingly clavate in male, weakly clavate in female.....*Eritettix tricarinatus* (Thomas)

HH1. Fastigium with surface deplanate or concave or with a conspicuous infra-marginal impression.

I2. Fastigium deplanate, with a weak medio-longitudinal carina best indicated distad (but occasionally absent, due to individual variation).

J. Tegmina of male with three distinct longitudinal veins in marginal field, discoidal field with a network of intercalated veinlets; of female with marginal field forming hardly more than one-third the width of tegmen and widest meso-distad. Abbreviate female tegmina with apex falcate or subfalcate (rarely females are macropterous). Male subgenital plate very bluntly conical. Pronotal lateral lobes of male shining blackish....*Chloealtis conspersa* Harris

JJ. Tegmina of male with but one distinct longitudinal vein in marginal field, discoidal field without network of intercalated veinlets; of female with marginal field forming nearly half width of tegmen and widest point mesad. Abbreviate female tegmina with apex simple. Male subgenital plate conically produced. Pronotal lateral lobes of male not as strikingly dark.....
Chrysochraon abdominalis Thomas

I12. Fastigium with a conspicuous infra-marginal impression, lacking a medio-longitudinal carina.

J1. Pronotum with lateral lobes curving to meet disk, medio-longitudinal and incurved lateral carinae weaker. Structure graceful.

K. Vertex blunt, its central depression extending close to apex. Pronotum with lateral carinae little incurved, about equally separated cephalad and caudad particularly in female. Prozona longer than metazona.....
Orphulella speciosa Scudder

KK. Vertex rectangular or a little acute in male, its central depression removed from apex one-third (male) to one-fourth (female) the width of the vertex. Pronotum with lateral carinae strongly incurved with angulation often indicated, the distance between them greater caudad than cephalad. Prozona and metazona about equal in length.....*Orphulella pelidna* (Burmeister)

JJ1. Pronotal lateral lobes deplanate and nearly vertical; disk deplanate with medio-longitudinal and lateral carinae decided. Structure heavier.....
Dichromorpha viridis (Scudder)

FF2. Lateral foveolae of vertex visible from above.

G2. Male stridulating rasp in normal position, on internal surface of caudal femora. Small species.

H2. Antennae clavate.....*Gomphocerus clavatus* Thomas

HH2. Antennae simple.

I3. Tegmina with marginal field fenestrate in male. Lateral carinae of pronotal disk weakly arcuate constricted. Caudal tibiae buffy.....
Chorthippus curtipennis (Harris)

II3. Tegmina with marginal field simple in male. Lateral carinae of pronotal disk very weak, considerably constricted. Caudal tibiae pink.....
Ageneotettix deorum (Scudder)

GG2. Male stridulating rasp on tegmina.

J2. Pronotum with lateral carinae parallel. Sternite preceding male subgenital plate with a black medio-longitudinal line. Pronotum with prozona and metazona equal in length.....*Stethophyma platyptera* (Scudder)

JJ2. Pronotum with lateral carinae distinctly divergent caudad. Sternite preceding male subgenital plate immaculate. Pronotum with prozona shorter than metazona.

K1. Tegmina lacking a pale stripe. Size smaller..*Stethophyma gracile* (Scudder)

KK1. Tegmina with a pale stripe proximad near costal margin. Size larger.....
Stethophyma lineatum (Scudder)

EE2. Caudad margin of pronotal disk strongly produced; acute, rectangulate or nearly so. Pronotum usually with a distinct median keel. Face usually nearly vertical and rounding into vertex.

F3. Wings black with a pale border.....*Dissosteira carolina* (Linnaeus)

FF3. Wings not black.

G3. Disk of wings nearly or quite transparent.

H3. Prozona of pronotum tectate with lateral carinae absent. (Wings usually faintly clouded with dusky cephalad of median portion of periphereal margin.).....*Chortophaga viridifasciata* (DeGeer)

HH3. Prozona of pronotum relatively flat, the lateral carinae conspicuous.

I4. Pronotal median carina high, prozona nearly as extensive as metazona. Wings faintly clouded with dusky at tip, the disk very faintly yellowish..... *Encoptolophus sordidus* (Burmeister)

II4. Pronotal median carina low, prozona much smaller than metazona. Wings transparent, very faintly dusky at tips.....*Camnula pellucida* (Scudder)

GG3. Disk of wings opaque, colored and plainly bounded by a dark band (except in *Trachyrhachis.*)

H4. Median carina of pronotum entire, not incised.

I5. Median carina of pronotum high, arched, strongly cristate. Taenia of (broad) wing band short. Large. (Appears adult in summer. Caudal tibiae usually blackish to proximal annulus. Wing disk yellow through orange to pink.).... *Arphia xanthoptera* (Burmeister)

II5. Median carina of pronotum much lower, very feebly arched. Taenia of wing band elongate. Smaller.

J3. Impressed area of fastigium as broad as (male) or broader than (female) long, its sides straight convergent to the acute apex (particularly in male). Vertex joining frontal costa with definite angulation indicated in the convexity. (Appears adult in spring. Wing disk always yellow. Caudal tibiae with meso-distal portion of dark section often briefly glaucous or buffy.)..... *Arphia sulphurea* (Fabricius)

JJ3. Impressed area of fastigium longer than broad, its sides slightly arcuate convergent to the truncate apex. Vertex joining frontal costa with less or no angulation indicated.

K2. Occiput and juncture of vertex with frontal costa less evenly convex. Appears adult in spring. Wing disk pink through orange to yellow, band narrow to medium broad. Caudal tibiae with dark section usually almost entirely supplanted by light glaucous or buff, sometimes as in *sulphurea*..... *Arphia conspersa* Scudder

KK2. Occiput and juncture of vertex with frontal costa evenly convex. Appears adult in summer. Wing disk rich pink to (rarely and never except in northeastern portion of its distribution) buff yellow, band very broad. Caudal tibiae usually blackish to proximal annulus.....*Arphia pseudonietana* (Thomas)

HH4. Median carina of pronotum incised.

I6. Size large. Form very robust. Antennae not or but little exceeding length of head and pronotum. (Wing with taenia very elongate.)

J4. Pronotum with prozona and metazona equal in length. Vertex with impressions very shallow, rounding evenly into the broader frontal costa (which is not sulcate dorsad. Median carina of pronotum with a single incision. Wing disk yellow to pink. Caudal tibiae buff.).....*Hippiscus rugosus* (Scudder)

JJ4. Pronotum with prozona considerably shorter than metazona. Vertex with impressions deeper, rounding with angulation indicated into the narrower frontal costa.

K3. Frontal costa not sulcate dorsad. Antennae of male not curling distad in drying. Caudal femora narrower.

L. Fastigium narrowing evenly distad. Numerous rugae of pronotal disk fine, even and inconspicuous. Tegmina in part irregularly maculate. (Median carina of pronotum with a single incision. Wing disk pink to deep pink. Caudal tibiae buff.).....*Pardalophora apiculata* (Harris)

LL. Fastigium narrowing irregularly distad. Less numerous rugae of pronotal disk heavier, irregular and conspicuous. Tegmina more regularly and exten-

sively maculate (in all but dorsal fields). (Median carina of pronotum normally with a single incision, but occasionally as in *X. c. latefasciatus*. Wing disk yellow to pink. Caudal tibiae buff, occasionally pink.).....
Pardalophora haldemanii (Scudder)

KK3. Frontal costa sulcate dorsad. Antennae of male curling distad in drying. Caudal femora broader. (Fastigium narrowing very irregularly distad. Pronotal disk with coarse tubercles and rugae. Tegmina prominently maculate. Median carina of pronotum twice incised, on metazona usually very feeble and flanked by irregular ridges. Wing disk yellow to pink. Caudal tibiae very rich pink.).....*Xanthippus corallipes latefasciatus* Scudder

II6. Size smaller. Form decidedly more graceful. Antennae very much longer than head and pronotum.

J5. Median carina of pronotum with a single incision. (Wing disk yellow, band broad, taenia short.

K4. Caudal tibiae pink with a broad brown annulus after the proximal buffy annulus.

L1. Larger; total length of male over 26, of female over 31 mm. Vertex moderately produced. Median carina of pronotum weakly cristate. Tegmina weakly banded.....*Spharagemon bolli* Scudder

LL1. Smaller; total length of male under 25, of female under 30 mm. Vertex less produced. Median carina of pronotum very weakly cristate. Tegmina maculate so that partial banding is indicated.....
Scirtetica marmorata marmorata (Harris)

KK4. Caudal tibiae pink with a proximal buff annulus. (Median carina of pronotum strongly cristate. Tegmina tessellate, with banding often weakly suggested.).....*Spharagemon collare* (Scudder)

JJ5. Median carina of pronotum bilobate cephalad, twice incised.

K5. Wings hyaline, immaculate. (Size small.).....
Trachyrhachis kiowa kiowa (Thomas)

KK5. Wing disk colored, bounded by a band.

L2. Antennae simple. Wing disk yellow.

M. Prozona ascending to the elevated occiput. Size small. Wing disk lemon yellow. (Frontal costa moderately narrow dorsad. Caudal tibiae buffy or light glaucous without post-proximal annulus.).....
Trachyrhachis kiowa thomasi (Caudell)

MM. Prozona not ascending, occiput normal. Size larger. Wing disk light yellow.

N. Wings normal.

O. Wing band moderately broad. (Caudal tibiae buffy or pink, without annuli...
Trimerotropis maritima interior E. M. Walker

OO. Wing band very broad. (Caudal tibiae buffy.).....
Trimerotropis pallidipennis saltina McNeill

NN. Wings very deep with several radial veins distinctly thickened (particularly in males). Caudal tibiae buffy with post-proximal and apical darkening.....
Circotettix verrucullatus (Kirby)

LL2. Antennae subensiform. Wing disk pink to flame scarlet. (Prozona not ascending, occiput normal. Size small. Frontal costa extremely narrow dorsad. Caudal tibiae with post-proximal and distal suffusions.....
Psinidia fenestralis fenestralis Serville

DD2. Prosternum spined.

E3. Tegmina present.

F4. Size large, tegmina over an inch in length. Subgenital plate of male deeply notched.

G4. Size very large. Brown, conspicuously varied with ashy and yellow stripes and dark spots.....*Schistocerca americana americana* (Drury)

GG4. Size large. Very rarely spotted and never with color pattern of *americana*.

H5. Buffy, with a pale buffy or yellowish dorsal stripe and brown markings. Dorsal bands across caudal femora often suggested, varying from absent to decided. Caudal tibiae buffy or pink.....*Schistocerca lineata* Scudder

HH5. With *lineata* too variable to distinguish in key. Brown varying through yellowish brown to olive green, often without a dorsal stripe. Dorsal bands across caudal femora usually absent, occasionally very weakly indicated. Caudal tibiae buffy, vary through pinkish brown to dark brown.....
Schistocerca alutacea Harris

FF4. Size medium or small, tegmina not over an inch in length.

G5. Head of normal size.

H6. Species peculiar to *Artemisia*. Lateral margins of male subgenital plate straight. (Size small. Tegmina lanceolate pads, very rarely fully developed. Brownish white or greenish white, rarely darker. Male furcula adjacent, short, straight fingers; cerci simple, weakly incurved; subgenital plate conical.).....*Hypochlora alba* (Dodge)

HH6. Not monotropic. Lateral margins of male subgenital plate ampliate proximad or throughout.

I7. General coloration light green. (Organs of flight little to distinctly reduced.)

J6. Prozona smooth. Size small. A median line on pronotum and often dorsal fields of tegmina purplish pink. Pronotal lateral lobes usually with a dark marking. Caudal femora externally often maculate, with a sub-apical pink annulus. (Decided color variation occurs.).....
Hesperotettix viridis pratensis Scudder

JJ6. Prozona with a network of very low, even rugae. Size medium. A median line on pronotum and along dorso-external margin of caudal femora (which spreads distad) purplish pink. Caudal femora otherwise and tegmina entirely immaculate.....*Hesperotettix speciosus* Scudder

II7. General coloration not light green.

J7. Organs of flight showing marked reduction.

K6. Tegmina represented by pads.

L3. Tegmina represented by slender, elongate pads. (Caudal femora green with apices dark. Caudal tibiae green with immediate bases dark.....
Melanoplus gracilis (Bruner)

LL3. Tegmina represented by ovate or lanceolate pads.

M1. Caudal tibiae green. (Caudal femora greenish, heavily marked with blackish brown. Caudal tibiae paling proximad, there with dark markings. Tegmina ovate.).....*Melanoplus viridipes viridipes* Scudder

MM1. Caudal tibiae pink.

N1. Tegmina represented by ovate pads. Furcula very small.

O. Male cerci broad, narrowing gradually to the broad, rounded apices. Surface smoother. Size larger. Tegminal pads more ample (organs of flight very rarely fully developed). Prefers open weedy areas.....
Melanoplus scudderi scudderi (Uhler)

OO. Male cerci narrowing rapidly, narrow distad with slender, sharply rounded apices. Surface rougher. Size smaller. Tegminal pads less ample. Sylvan..
Melanoplus mancus islandicus Blatchley

NN1. Tegmina represented by lanceolate pads, (organs of flight rarely fully developed). Furcula large. (Size very small. Abdomen usually appearing ringed. Ventral surface yellow buff.).....*Melanoplus dawsoni* (Scudder)

KK6. Tegmina and wings covering only part of abdomen (sometimes fully developed in *fasciatus* and *borealis junius*).

L4. Male cerci with apex not spatulate. (Caudal femora without conspicuous external markings.)

M2. Male cerci broad, gradually narrowing but still broad distad, with rounded apex dorsad. Furcula very large and elongate. These parts much as in *femur-rubrum*. Male subgenital plate margined with blackish. (Caudal tibiae pale glaucous, buffy or pink.).....*Melanoplus borealis junius* (Dodge)

MM2. Male cerci tapering, very slender distad. Furcula small. (Caudal tibiae pink.).....*Melanoplus dodgei huroni* Blatchley

LL4. Male cerci with apex spatulate. (Caudal tibiae pink.)

M3. Caudal femora with three very conspicuous pale areas on external surface. Spatulate apex of male cerci short.....*Melanoplus walshii* Scudder

MM3. Caudal femora without conspicuous external marking. Spatulation of apex of male cerci elongate.....*Melanoplus fasciatus* (F. Walker)

JJ7. Organs of flight not reduced, (see exceptions under J7 in *scudderi scudderi, dawsoni, borealis junius* and *fasciatus*). (No satisfactory key for separating females of this section of *Melanoplus* can yet be supplied.)

K7. Male cerci with a lateral projection or forked.

L5. Male cerci with a projecting angulation of the ventral margin.

M4. Size very large. Caudal tibiae yellowish buff (always except in California). Male cerci with a rounded projection mesad on ventral margin. Appears adult in summer.....*Melanoplus differentialis* (Thomas)

MM4. Size medium small. Caudal tibiae pink or glaucous. Male cerci with a rounded obtuse-angulation almost mesad on ventral margin. Appears adult in spring.....*Melanoplus confusus* Scudder

LL5. Male cerci forked.

M5. This forking with dorsal arm much the shorter and directed horizontally inward. Size very small. Caudal tibiae pale glaucous.....
Melanoplus infantilis Scudder

MM5. This forking with dorsal arm much the longer and directed dorsad. Size medium small. Caudal tibiae rich pink....*Melanoplus keeleri luridus* (Dodge)

KK7. Male cerci simple or merely with apices expanded.

L6. Male cerci with apices conspicuously expanded.

M6. These apices greatly expanded.

N2. Size large. Coloration striped, not mottled. Caudal femora buffy internally and ventrad. Caudal tibiae pink, buffy or bluish black. Terrestrial.....
Melanoplus bivittatus (Say)

NN2. Size medium. Coloration mottled, not striped. Caudal femora deep pink internally and ventrad. Caudal tibiae pink and very hirsute. Aboreal.....
Melanoplus punctualatus punctulatus (Scudder)

MM6. Male cerci with apices only moderately expanded.

N3. Male subgenital plate with undivided apex.

O1. Male cerci with shaft very broad and apical expansion much the stronger ventrad. Size medium small, form comparatively robust. Appearance mottled. (Caudal tibiae pink.).....*Melanoplus gladstoni* Scudder

OO1. Male cerci with shaft moderately broad and apical expansion symmetrical, equal dorsad and ventrad. Size larger (in Minnesota), form more graceful. Appearance not mottled.

P. Male penis with valves equally projecting (this in normal position is concealed under the pallium. Disk of pronotum longitudinally striped. Caudal tibiae glaucous or pink.) ..... *Melanoplus packardii* Scudder

PP. Male penis with projections of one pair of valves reaching far beyond the apices of the other pair of valves. (The following three forms are too close and too variable to be separable in any key of reasonable length.)

Q. Disk of pronotum usually longitudinally striped (this sometimes absent in *foedus foedus*).

R. Coloration very dark. Disk of pronotum contrastingly and heavily longitudinally striped. Dark bands across caudal femora heavy. Inhabitant of sandy coniferous regions. (Caudal tibiae always pink.) ..... *Melanoplus stonei* Rehn

RR. Coloration usually paler (not so, however, in the Northwest). Disk of pronotum usually (but not always) longitudinally striped. Dark bands across caudal femora less heavy (at least in Minnesota). Inhabitant of dried West. (Caudal tibiae pink, buffy or glaucous.) ... *Melanoplus foedus foedus* Scudder

QQ. Disk of pronotum not striped, usually paler than sides. Inhabitant of river valleys. (Caudal tibiae glaucous, buffy or pink. Ventral surfaces of caudal femora buffy to rich orange red, never the latter in typical *foedus*. Caudal tibiae glaucous, buffy or pink.) ..... *Melanoplus foedus fluviatilis* Bruner

NN3. Male subgenital plate with twin rounded apices, due to a meso-distal impression. (Male cerci with shaft moderately broad and apical expansion normally very slightly greater ventrad than dorsad. Size small, form comparatively graceful. Caudal tibiae glaucous or pink.) .....
Melanoplus augustipennis (Dodge)

LL6. Male cerci with apices scarcely expanded.

M7. Male cerci elongate and very slender, the rounded apices with merest trace of thickening. (Size medium, form graceful for genus. Caudal tibiae rich glaucous.) ..... *Melanoplus flavidus flavidus* Scudder

MM7. Male cerci broad, tapering to broadly rounded apices. (Size medium small to small.)

N4. Male subgenital plate not produced dorso-caudad, with undivided apex.

O2. Male furcula very large and elongate. Male cerci broad, directed caudad. Male subgenital plate large and broadly convex .....
Melanoplus femur-rubrum femur-rubrum (DeGeer)

OO2. Male furcula very small. Male cerci very broad, directed dorso-caudad. Male subgenital plate small and very bluntly rounded conical .....
Melanoplus occidentalis occidentalis (Thomas)

NN4. Male subgenital plate produced dorso-caudad, with twin apices, due to a meso-distal impression.

O3. Male subgenital plate moderately produced dorso-caudad, with meso-distal impression normally prominent. A campestran environment preferred.

P1. Size normal for genus, smaller. Pronotum not sellate. Organs of flight fully developed. Male cerci narrower and more elongate. (Caudal tibiae pink or glaucous.) ..... *Melanoplus mexicanus mexicanus* (Saussure)

PP1. Size larger. Pronotum showing sellation. Organs of flight unusually fully developed. Male cerci broader and shorter. (Caudal tibiae pink.) .....
Melanoplus mexicanus ph. *spretus* (Walsh)

OO3. Male subgenital plate strongly produced dorso-caudad, with meso-distal impression prominent, weak or obsolete. Sylvan .....
Melanoplus bruneri Scudder

GG5. Head disproportionately large to size of body. (Size small. Tegmina represented by lanceolate pads, but organs of flight sometimes fully developed.

Furcula minute. Male cerci tapering suddenly, distad very slender. Male subgenital plate with an apical tubercle. Caudal tibiae glaucous.) .....
Phoetaliotes nebrascensis (Thomas)

EE3. Tegmina absent. (Size small. With dark green markings. Male cerci elongate, slender, with enlarged apex angulate-produced ventro-caudad. Male subgenital plate with a subapical tubercle. Caudal tibiae green.) .....
Podisma glacialis canadensis E. M. Walker

BB1. Antennae extremely slender, much longer than body (except in Gryllotalpinae and Tridactylinae). Auditory organs, when present, on cephalic tibiae. Stridulating organs of male, if present, in anal fields of tegmina. Ovipositor, when exserted, forming an elongate blade or tube.

C3. Tarsi four-jointed. Tegmina slopin gat sides of body (much smaller anal fields alone deplanate) when organs of flight are present. Ovipositor compressed, blade-like, with apex not enlarged.

D3. Organs of flight present. Auditory foramina present proximad on cephalic femora. Male tegmina with intricate stridulating area in anal fields.

E4. Posternum unarmed. (General coloration green.)

F5. Tegmina long and relatively narrow, very little broader mesad than distad. Fastigium horizontal or but little deflected, little if at all wider than proximal antennal joint.

G6. Male with ultimate tergite not produced in an elongate median process; cerci long and gently incurved, with apex not enlarged; subgenital plate not compressed distad. Ovipositor longer and more evenly and broadly curved dorsad. (Tegmina broad. Size medium for genus.) .....
Scudderia septentrionalis (Serville)

GG6. Male with ultimate tergite produced in an elongate median process; cerci shorter and very strongly incurved distad, with apex decidedly enlarged; subgenital plate compressed distad. Ovipositor shorter and showing angulation of its stronger curvature dorsad.

H7. Male with production of disto-dorsal abdominal segment furcate at apex, with no median projection.

I8. Male with lobes of furcate apex of disto-dorsal abdominal segment bearing ventrad small vertical longitudinal flanges.

J8. Tegmina very broad and short. Size medium for genus. Male with lobes of furcate apex of disto-dorsad abdominal segment distinctly tapering distad when seen from above.....*Scudderia pistillata* Brunner

JJ8. Tegmina narrower and longer. Size large for genus. Male with lobes of furcate apex of disto-dorsal abdominal segment subequal in width when seen from above. (Partial to oak.)....*Scudderia curvicauda curvicauda* (DeGeer)

II8. Male with lobes of furcate apex of disto-dorsal abdominal segment lacking ventral flanges. (Size small and tegmina moderately elongate for genus.)....
Scudderia furcata furcata Brunner

HH7. Male with production of disto-dorsal abdominal segment truncate at apex with as light median projection and with strongly compressed lateral flanges. (Tegmina and size as in *curvicauda curvicauda,* females scarcely distinguishable but ovipositor sometimes slightly narrower distad.) .....
Scudderia texensis Saussure and Pictet

FF5. Tegmina very broad, distinctly broader mesad than distad. Fastigium curving down to facial fastigium and very wide.

G7. Cephalic and median tibiae flat or sulcate dorsad with margins raised. Cephalic margin of pronotum lacking a median projection. Tegmina oblong-elliptical or ovate. Caudal femora elongate. Ovipositor large and elongate, curved

dorsad, with margins convex-convergent to acute apex. (Male subgenital plate with distal margin V-emarginate.)

H8. Humeral sinus of pronotal lateral lobes prominent. Tegmina at least three times as long as greatest width. Wings surpassing apices of tegmina. Size large for genus.....*Amblycorypha oblongifolia* (DeGeer)

HH8. Humeral sinus of pronotal lateral lobes weakly indicated. Tegmina decidedly shorter. Wings not surpassing tegminal apices. Size medium for genus.....*Amblycorypha rotundifolia iselyi* Caudell

GG7. Cephalic and median tibiae convex dorsad. Cephalic margin of pronotum with a small angulate production mesad. Tegmina ovate-lanceolate. Caudal femora shorter. Ovipositor extremely small, with distal extremity of ventral valves truncate. (Size very large.)...*Microcentrum rhombifolium* (Saussure)

EE4. Prosternum armed with a pair of elongate, erect spines (except in *Conocephalus saltans* and *Anabrus simplex*).

F6. Form elongate. Pronotum normal, not unusually produced caudad.

G8. Size large. Vertex produced cephalad in an elongate cone. (Organs of flight fully developed and very elongate.)

H9. Size large for genus; larger and more robust. Vertex produced with ventral surface immaculate or rarely with a very small distal maculation.....
Neoconocephalus robustus (Scudder)

HH9. Size medium for genus; smaller and more slender. Vertex very strongly produced, with ventral surface narrowly but continuously margined laterad and distad with black.....*Neoconocephalus ensiger* (Harris)

GG8. Size much smaller. Vertex much less produced, its apex truncate and its sides concave. (Organs of flight fully developed to greatly reduced.)

H10. Small insects but averaging larger and more robust. Stridulating field of male tegmina normally proportionately more extensive. (General coloration green.)

I9. Male cercus of moderate length, with portion beyond tooth little if any longer than portion before it. (Ovipositor shorter, never distinctly over half as long as caudal femur.)

J9. Male cercus with a large dorsal node (but no carina) meso-distad. Form more robust. Tibiae not darkened. (Moderately macropterous and (rarer) strongly macropterous phases developed.)

K8. Pronotal lateral lobes with humeral sinus distinct. Male cercus with apical portion of shaft longer than tooth and its apex blunt. Ovipositor curved evenly dorsad, only slightly broader mesad than elsewhere.....
Orchelimum vulgare Harris

KK8. Pronotal lateral lobes with humeral sinus very weakly indicated. Male cercus with apical portion of shaft equal in length to tooth and its apex sharper. Ovipositor with dorsal margin straight beyond base, strikingly broadest mesad.....*Orchelimum gladiator* Bruner

JJ9. Male cercus dorsad with a distinct, obtuse, sinuate carina, but lacking a node. Form more graceful. Tibiae darkened, usually black. Occurs only in proximity of water.....*Orchelimum nigripes* Scudder

II9. Male cercus more elongate, with portion beyond tooth distinctly longer than portion before it. (Form graceful.)

J10. Ovipositor not distinctly over half as long as caudal femur, more slender and showing stronger curvature dorsad. Eastern race.....
Orchelimum concinnum concinnum Scudder

JJ10. Ovipositor distinctly over half as long as caudal femur, heavier and showing very weak curvature dorsad. Western race.....
Orchelimum concinnum delicatum Bruner

HH10. Very small insects and averaging smaller and less robust. Stridulating field of male tegmina normally proportionately less extensive. (Ovipositor narrow and usually very feebly curved.)

I10. Caudal tibiae armed at distal extremity with three pairs of spurs.

J11. Male cercus armed with a heavy mesal (in vertical sense) tooth, so that its base is visible from above.

K9. Male cercus with distal portion weakly to very decidedly depressed and with apex broad and rounded. (General coloration green. Ovipositor nearly straight and of medium length for genus.)

L7. Male cercus with distal portion moderately produced, the weak depression general and not more decided on the internal side. Ovipositor averaging more delicate and shorter. (Always macropterous, but degree highly variable.).....
Conocephalus fasciatus fasciatus (DeGeer)

LL7. Male cercus with distal portion more decidedly produced and very decidedly depressed, particularly on the inner side. Ovipositor averaging heavier and longer. (Normally brachypterous, rarely macropterous.).....
Conocephalus brevipennis (Scudder)

KK9. Male cercus with distal portion not at all depressed and with apex acuminate. (Normally brachypterous, macropterism very rare.)

L8. Vertex broad, very weakly ascending. Male cercus with distal portion short, blunt conical. Ovipositor much shorter than caudal femur. (General coloration brown, rarely greenish on sides.).....*Conocephalus nemoralis* (Scudder)

LL8. Vertex very broad, not ascending. Male cercus with distal portion very elongate, with apex strongly acuminate. Ovipositor very much longer than caudal femur. (General coloration green, sometimes brown.).....
Conocephalus strictus (Scudder)

JJ11. Male cercus armed with a more delicate ventral (in vertical sense) tooth, so that but little of this tooth is visible from above (mesal portion of cercus swollen and elongate ovate). (Brachypterous, rarely macropterous.)

K10. Coloration solid, distinctive and vivid, abdomen black (wholly or in large part), tegmina and caudal limbs rich green in life. Male cercus shorter. Form slightly more robust. Ovipositor much shorter (considerably longer than to shorter than caudal femur).....*Conocephalus nigropleurum* (Bruner)

KK10. Brown and brownish buff, head and pronotum trifasciate. Male cercus longer. Form slightly more slender. Ovipositor much longer (very much longer than caudal femur).....*Conocephalus attenuatus* (Scudder)

II10. Caudal tibiae armed at distal extremity with one pair of spurs. (Prosternum unarmed. Male cercus very slender, with a long median (in vertical sense) tooth. Green or brown. Normally brachypterous, occasionally macropterous. Ovipositor distinctly shorter to distinctly longer than caudal femur).....
Conocephalus saltans (Scudder)

FF6. Form robust. Pronotum produced caudad over base of abdomen, wholly concealing the rudimentary female tegmina. (Ovipositor elongate and slender.)

G9. Prosternum armed. Size medium large. Pronotum with conspicuous lateral carinae. Male tegmina abbreviate but extending considerably beyond caudal margin of pronotum. Ovipositor straight or faintly deflexed, with acute apex ventral. Sylvan, eastern.....*Atlanticus testaceus* (Scudder)

GG9. Prosternum unarmed. Size very large. Pronotum without lateral carinae. Male tegmina very abbreviate, scarcely projecting beyond caudal margin of pronotum. Ovipositor faintly curved dorsad, with acute apex median. Western. *Anabrus simplex* Haldeman

DD3. Organs of flight and auditory foramina absent.

E5. Fastigium produced as two small adjacent cones. Cephalic tibiae disto-dorsad with a single external spine. Caudal tibiae with dorsal margins armed with very numerous, minute, closely set teeth and one longer pair of spines near apical fourth. Caudal metatarsus with a dorso-distal median spine. Limbs very elongate and conspicuously mottled. Ovipositor with internal valves armed distad with microscopic truncate teeth..... *Tachycines asynamorus* Adelung

EE5. Fastigium not produced or feebly produced as a single, very low, rounded cone. Cephalic tibiae disto-dorsad with a spine on each side. Caudal tibiae with dorsal margins armed with very minute teeth and several pairs of elongate spines. Caudal metatarsus unarmed dorso-distad. Limbs shorter and not as strikingly mottled. Ovipositor with internal valves armed distad with very elongate ventral teeth.

F7. Size smaller and medium robust. Limbs longer. Cephalic tibiae unarmed meso-dorsad. Caudal tarsi with second joint twice as long as third.

G10. Dorsum dark, maculate, with a longitudinal band of paler.

H11. Maculation more conspicuous, but longitudinal band much weaker. Male subgenital plate with distal margins of lobes transverse and concave, these lobes rounded produced laterad and briefly produced at their juncture mesad..... *Ceuthophilus maculatus* (Harris)

HH11. Maculation less conspicuous, but longitudinal band much more prominent. Male subgenital plate with lobes each rounded angulate produced beneath cerci, their distal margins forming an angulate emargination between..... *Ceuthophilus latens* Scudder

GG10. Pale with dark markings, these forming transverse bands on abdomen, no longitudinal banding indicated.

H12. Male with dorsal portion of eighth abdominal tergite only moderately produced in lateral aspect. Male pseudosternite with a pair of meso-dorsal rounded-conical projections.....*Ceuthophilus fusiformis* Scudder

HH12. Male with dorsal portion of eighth abdominal tergite strongly produced in lateral aspect. Male pseudosternite with a pair of strongly separated, weakly serrate, dorsally arcuate crests.....*Ceuthophilus silvestris* Bruner

FF7. Size very large and robust. Limbs shorter. Cephalic tibiae armed meso-dorsad on inner margin with a spine. Caudal tarsi with second joint subequal in length to third.....*Udeopsylla robusta* (Haldeman)

CC3. Tarsi three jointed (or less in *Tridactylus*). Tegmina horizontal in greater part, the narrow lateral portions alone bent downward. Ovipositor, when exserted, forming a slender tube with apex enlarged (except in *Anaxipha exigua*).

E6. Tarsi compressed.

F8. Cephalic tibiae normal. Male tegmina distad provided with a speculum. Ovipositor exserted.

G11. Head short, vertical or nearly so. Caudal femora stout. Caudal tibiae armed with large spines but lacking teeth between them. Ocelli present. Color brown or black.

H13. Caudal metatarsus flat above with a row of very small teeth on each side. Caudal tibiae armed with fixed spines which are shorter and glabrous. No large bristles on body and limbs. Size large.

I11. Dark brown or black. Head not barred.....*Gryllus assimilis* Fabricius

II11. Straw colored. Head with a dark bar between the eyes and another between the antennal sockets.....*Gryllus domesticus* Linnaeus

HH13. Caudal metatarsus rounded, unarmed but hirsute dorsad. Caudal tibiae armed with movable spines which are elongate and velutinous. Large bristles present on body and limbs. Size small.

I12. Caudal tibiae with the very small pair of ventral apical spurs unequal in length. Ovipositor longer, its teeth very fine.

J12. Dark, usually with occiput striped, extremely variable but without the distinctive combinations of characters found in the other species.....
Nemobius fasciatus fasciatus (DeGeer)

JJ12. Face below antennae black. Dorsal surface of head, pronotum, abdomen and caudal femora with gray pile, interspersed with black bristles. Tegmina gray above, usually with a fuscous stripe along anal vein in female. (Found in sand areas.).....*Nemobius griseus griseus* E. M. Walker

II12. Caudal tibiae with the very small pair of ventral apical spurs equal in length. Ovipositor short, its teeth coarse. (Coloration very uniform, clear brown. Ultimate palpal joint buff, sometimes with apex suffused.).....
Nemobius carolinus carolinus Scudder

GG1. Head elongate, horizontal. Caudal femora slender. Caudal tibiae armed with elongate delicate spines with minute teeth between them. Ocelli absent. Color white or pale green.

H14. Antennae with black marks on proximal joints. Front of head and bases of antennae never pinkish. Male tegmina dorsad less than half as broad as long.

I13. First two antennal joints each with a single black mark.

J13. First antennal joint with a J-shaped black mark, second with a black dot.....
Oecanthus angustipennis Fitch

JJ13. First and second antennal joints each with a black dot.....
Oecanthus niveus (DeGeer)

II13. First two antennal joints each with two black marks.

J14. Marks on first antennal joint well separated. Antennae, head, pronotum, and ventral surface of abdomen otherwise immaculate. More graceful.....
Oecanthus nigricornis quadripunctatus Beutenmüller

JJ14. Marks on first antennal joint heavy, often confluent. Antennae, head, and ventral surface of abdomen often washed with blackish, pronotum often weakly to heavily trifasciate. More robust.....
Oecanthus nigricornis nigricornis F. Walker

HH14. Antennae lacking black marks on proximal joints, which with adjacent portions of head, are usually suffused with pinkish. Male tegmina dorsad more than half as broad as long.....*Oecanthus latipennis* Riley

FF8. Cephalic tibiae specialized for digging. Male tegmina lacking a speculum. Ovipositor not exserted.

G12. Large. Antennae with very many joints. Two large ocelli present. Tarsi three-jointed. Body hirsute. Brown.....*Gryllotalpa hexadactyla* Perty

GG12. Exceedingly small. Antennae with few (eleven) joints. Cephalic and median tarsi two-jointed. Caudal tarsi with a single joint or absent. Body smooth.

H15. Larger. Pronotum with a weak transverse sulcus. Shining brown, little or not maculate. Caudal metatarsi present.....*Tridactylus apicialis* Say

HH15. Smaller. Pronotum not sulcate. Dark brown usually strikingly maculate with buffy. Caudal metatarsi absent.....*Tridactylus minutus* Scudder

EE6. Tarsi with second joint distinct, depressed, heart-shaped. (Ovipositor compressed, curved dorsad, serrulate at acute apex; apical portion widened (vertically) but not thickened. Small. Straw color with caudal femora usually showing a longitudinal dark stripe along its ventra-external surface)..... *Anaxipha exigua* (Say)

BLATTIDAE

Pseudomopinae

Blattella germanica (Linnaeus)

Bemidji, IX, 21, 1918 (V. R. Haber), 2♀. Lake Itasca, 2♀. St. Anthony Park, IX, 10, 1922 (H. H. Knight), 1♀.

This is an introduced household pest.

Parcoblatta virginica (Brunner)

Lake Itasca, VI, 16 (S. A. Graham), 1♂ (organs of flight very ample). Hinckley, VI, 20, 1919 (V. R. Haber), 1♂. Pine County, VI, 20, 2♂. St. Anthony Park, VI, 4, 1899, 1♂. Frontenac, V, 29, 1930 (Stehr; Mickel), 3♂.

This woodland species is limited to the southern portion of the state, Hinckley and Lake Itasca being northern limits of distribution. It was recorded by Lugger as *Ischnoptera unicolor.*

Parcoblatta pennsylvanica (DeGeer)

Ottertail County, 1♂. St. Anthony Park (O. Lugger), 1♂. St. Paul, 1♂; VII, 31, 1920, 1♀. Ramsey County, 1♂. Frontenac, V, 25 and 19, 1930 (W. C. Stehr, 6♂, 1 large juv.♀; V, 29, 1930 (C. E. Mickel), 3♂. Lake Sylvia in Wright County, VII, 4, 1925 (H. Bull), 1♀. Savage Farm in Hennepin County, VI, 25, 1914 (on oak), 1♀. Fish Hatchery in Le Sueur County, VII, 21, 1922 (W. E. Hoffmann), 2♀. St. Peter, VIII, 8 to 20, 1922 (R. R. Holland), 1♀, 2 juv.♂, 1 juv.♀. Battle Lake, VIII, 14, 1925 (W. A. Riley), 1♂. Big Stone, VII, 15, 1915, 1♂.

This is the most abundant species of woodland cockroach, also limited to southern Minnesota, with northermost points in its distribution Lake Sylvia and Battle Lake.

Blattinae

Periplaneta americana (Linnaeus)

This is a domiciliary pest, common in the southeastern United States and generally distributed through the tropical and mild climates of the world.

It was certainly introduced in Minnesota and is probably limited to the southern portion of the state. It is now known to be very common in packing houses at South St. Paul and occurs in other buildings around the Twin Cities.

Blatta orientalis Linnaeus

We have examined a single specimen from Minneapolis and an immature from St. Anthony Park.

This is another domiciliary pest, but in the present case it was undoubtedly introduced into the United States from Europe. It thrives best in the central latitudes of this country and is probably established in towns in only the southern portion of Minnesota.

Several species of tropical Blattidae are likely to be found in shipments, particularly of fruit from the tropics. These are adventives with little or no possibility of ever becoming established, even indoors. Such a specimen of *Panchlora cubensis* Saussure is before us, a female taken from bananas at St. Paul, in February, 1929. Another is a female of *Periplaneta australasiae* (Fabricius) from St. Anthony Park.

MANTIDAE

No species of "Praying Mantis" inhabits Minnesota.

PHASMIDAE

Heteronemiinae

Diapheromera veliei veliei Walsh

Ft. Snelling, VI, 28[4] to VIII, 27, 1923 (Knight; Mickel; McIntosh; Hartig), 14 ♂, 1 ♀, 3 juv. Jordan, VII, 13, 1923 and VIII, 1, 1922 (Knight and Hoffman; in sand dunes), 1 ♂, 1 ♀. Brown Valley, VIII, 3, 1900, 1 ♂, 1 ♀, 1 juv. ♂. Pipestone, VIII, 17, 1899, 1 ♀.

Ft. Snelling and Browns Valley are northern limits; Staples is the former eastern limit of distribution of this grass-loving Great Plains race.

Diapheromera femorata (Say)

Wadena, VII, 24, 1921 (A. A. Nichol), 1 ♂. St. Anthony Park, VIII, 19, 1925 and IX, 19, 1899, 2 ♂. Hennepin County, VIII, 9, 1929 (R. E. Wall; in Basswood and maple forest), 1 ♂. St. Peter, VIII, 10 and 26, 1922 (R. R. Holland), 4 ♂.

Though known westward as far north as southern Manitoba, a northern limit in Minnesota is Wadena. This is an arboreal species.

[4] A teneral adult male was taken on this date.

ACRIDIDAE

Acrydiinae

Nomotettix parvus Morse

Described from St. Anthony Park, we have recorded this species from Fairview in Brown County and Douglas County, Kansas.

It was evidently confused with the following species by Somes.

Nomotettix cristatus cristatus (Scudder)

Lake Itasca, VIII, 10, 1914, 2♀. St. Anthony Park, 1897 (O. Lugger), 1♀, type of the synonym *Nomotettix sinuifrons* Hancock [Hebard Cln.]. Madison (Osborn), 2 small juvs.

Acrydium granulatum Kirby

The type of the synonym *luggeri* is a female from St. Anthony Park in the Minnesota state collection, with apex of fastigium irregularly blunter than usual, probably due to some injury to the specimen occurring in an earlier instar.

Fifty-one males, 45 females, taken April 12 to August 27 (but the great majority in the spring) and five immature individuals are from Two Harbors, Cass Lake, Lake Itasca, Warroad, Crookston, Norman County, Ottertail County, Chisago County, Rice Creek, New Brighton, St. Anthony Park, St. Paul, Ft. Snelling, Gray Cloud Island, Ramsey County, Hennepin County, and Pipestone.

Material of this common boreal species was reported both correctly and as the synonym *luggeri* by Lugger and Somes.

Acrydium acadicum acadicum (Scudder)

Fifteen males and 23 females were taken June 12 to August 21 (the great majority in the spring) and four immatures secured August 10, at Cass Lake, Warroad, Lake Itasca, Roseau, Frazee, Ottertail County, Wilkin County, St. Anthony Park, and Gray Cloud Island.

Six males and 10 females are caudate; two males and one female have a pale pronotal saddle and one female is pale, strikingly marked with dark brown.

This insect was reported by Somes as the synonymous *hancocki.*

Acrydium ornatum (Say)

Fourteen males and 11 females were taken April 29 to October 2 (the majority in the spring) at Grand Marais, Ottertail County, Lakeland, St. Anthony Park, Ft. Snelling, Ramsey County, Olmsted County, Hennepin County, Le Sueur County, Madison, Marshall, and Pipestone.

Eight males and 5 females are caudate. One female has a pale pronotal saddle.

The Grand Marais male (and one from Ft. Snelling) may represent depauperate *acadicum*. Females from that locality are needed to determine this. If *ornatum* is represented this record is far north of its previously known limits of distribution in this longitude, though both species occur in southern Manitoba.

This species was recorded correctly and as the synonym *triangularis* by Lugger.

Acrydium arenosum angustum (Hancock)

Eight males and 16 females, taken April 28 to July 17 (the majority in the spring) and seven immatures, were taken at Norman County, Mora, Princeton, Rice Creek, Battle Creek, Ft. Snelling, Gray Cloud Island, Cliff, Olmsted County, Savage, Lawrence, Ottawa, Madison, and Pipestone.

Two males have the pronotum abbreviate, four females have it considerably shortened, the others have it caudate.

This race was recorded by Lugger and Somes as *Tettix obscurus*.

Paratettix cucullatus (Burmeister)

Eleven males and 13 females, all caudate, taken May 20 to July 18, are from Newport, Battle Creek, Gray Cloud Island, Red Rock, Olmsted County, Hennepin County, Ottawa, and Owatonna.

This species, which inhabits the borders of streams, rivers, and lakes, occurs only in southern Minnesota, Newport and Owatonna being the northern limits of distribution.

Tettigidea lateralis (Say)

Twenty-seven males and 23 females, of which seven males and four females are brachypterous (all of these smaller than average) were secured April 28 to September 9 and one immature are from Lake Itasca, Norman County, Ottertail County, Friesland, Rice Creek, Lakeland, St. Anthony Park, St. Paul, Ft. Snelling, Ramsey County, Olmsted County, La Crescent, and Le Sueur County.

This series shows little variation in robustness, two females from St. Anthony Park and one from Friesland being only slightly heavier than the others. Compared with robust northeastern material (which has been referred to *lateralis parvipennis*) the average is more slender but not so slender as the majority from the southeastern United States (referred to *lateralis lateralis*). Moreover we have quite as slender specimens from New England and quite as robust specimens from some series from southern Georgia (where the most slender of all occur), so that the validity of what we have heretofore considered weakly defined geographic races is evidently open to question.

The species occurs in all but northern Minnesota, limits of distribution northward being Lake Itasca and Ottertail County.

Acridinae

Pseudopomala brachyptera (Scudder)

Brown Valley, VIII, 1 to 3, 1900, 11 ♂, 10 ♀, 2 juv. ♀. Pipestone, VIII, 17, 1899, 1 ♀.

A male and a female in the present series are submacropterous. Gray Cloud Island and Browns Valley are northern limital points in the species distribution.

Opeia obscura (Thomas)

Pipestone, VIII, 17, 1899 and IX, 27, 1898, 4 ♂, 11 ♀, 4 juv.

Fergus Fall is a northern and Mankato a northern and eastern limital point in the known distribution of this Great Plains species.

Eritettix tricarinatus (Thomas)

Foxhome, VIII, 22, 1912, 1 very small juv. Anoka County, VI, 8 to 30, 1920 to 1923 (Knight; Hoffmann), 2 ♂, 1 ♀ (pronotal carinae moderately bent). Brown Valley, X, 26, 1897, 1 juv. ♂, 3 juv. ♀ (pronotal carinae well bent). Pipestone, IX, 27, 1898, 1 juv. ♂ (pronotal carinae moderately bent), 1 juv. ♀ (pronotal carinae feebly bent).

Foxhome is a northern and Pipestone a southern known limit, while Anoka County is the easternmost point at which it has been taken. It is probable that the species is largely confined to the southern portion of western Minnesota and that eastward it is much more local, possibly there confined to sand or areas of poor soil.

Minnesota material is not as readily distinguished from *simplex* as are most South Dakota and Nebraska specimens. Whether or not intergradation is so indicated remains a vexing problem.

Orphulella speciosa Scudder

One hundred and five males and 138 females are from Cass Lake, Fergus Falls, Ottertail County, Wilkin County, Anoka County, Newport, Hamline, St. Anthony Park, Ft. Snelling, Ramsey County, Hennepin County, Browns Valley, and Pipestone.

The Fergus Falls and other Ottertail County specimens show more strongly than the rest of this series the brilliant coloration and striking pattern upon which the synonym *picturata* was based. Very few of the larger and more than usually macropterous specimens alone show a superficial resemblance to *pelidna*. According to Somes, Vermillion Lake and Lake of the Woods are northern limits.

Orphulella pelidna (Burmeister).

Ada, VII, 6, 1911 (D. Stoner), 3 ♂. Fergus Falls, VII, 17, 1912, 1 juv. ♂. Ottertail County, VIII, 21, 1912, 1 ♀. Foxhome, VIII, 22,

1912, 1 ♂. Wilkin County, VII, 25 to VIII, 22, 1912, 12 ♂, 1 ♀, 1 juv. ♂, 1 juv. ♀. Fridley, VII, 26, 1923 (R. W. Dawson; sand dunes, 1 ♂. Browns Valley, VIII, 3, 1900, 1 ♂. Heron Lake, VIII, 17, 1899, 1 ♀.

Mahtomedi, Detroit, and Crookston are northern limits.

Dichromorpha viridis (Scudder)

Monticello, Redwood Falls, and Pipestone are northern limits for this common species which is usually found among grass and weeds on waste land. No material from Minnesota, however, is in the state collection.

Chloealtis conspersa Harris

Sixteen males, 24 females, and three immatures (of which a single female without data is macropterous) are from Baptism River, Tower, Duluth, Cloquet, Koochiching County, Bena, Cass Lake, Beltrami County, Lake Itasca, Clear River, Crookston, Ada, Ottertail County, Hamline, St. Anthony Park, St. Paul, and Ramsey County.

The species occurs over all of Minnesota, being known south in Iowa and west in South Dakota.

Chrysochraon abdominalis Thomas

Greenbush, VII, 14, 1912, 1 large juv. ♂.

Somes reported this species from Bemidji, a southern limit, but not an eastern one as he supposed, the species having been recorded from Ft. William, Nepigon, and the Severn River, Ontario, and from localities in the Upper Peninsula and Gogebic County in lower Michigan.

Chorthippus curtipennis (Harris)

One hundred and ten males, 139 females (of which 15 males and 15 females are fully macropterous) and six immatures are from Grand Marais, Kawishiwi River, Two Harbors, Tower, Biwabik, Hibbing, St. Louis County, Willow River, Bena, Cass Lake, Black Duck, Lake Itasca, Warroad, Crookston, Ada, Nisswa, Fergus Falls, Ottertail County, Foxhome, St. Anthony Park, St. Paul, Gray Cloud Island, Ramsey County, Robbinsdale, New Ulm, Browns Valley, Sacred Heart, Heron Lake, Pipestone, and Luverne.

Gomphocerus clavatus Thomas

Seven males, 38 females and six immatures are from the Red River Valley, Fergus Falls, Ottertail County, Hamline, St. Paul, Ft. Snelling, Brown Valley, and Pipestone.

This species was reported as the synonym *clepsydra* by Somes. Its eastern limits are Crookston, Detroit, and Hamline, this including, as is the case with a number of other western species, approximately the southwestern half of the state.

Stethophyma platyptera (Scudder)

Somes recorded this species from Allen Junction, a northern limital point. We have not seen material from Minnesota.

Stethophyma gracile (Scudder)

Kawishiwi River, VIII, 1919 (H. H. Knight), 1 ♂. Sucker River, VIII, 12, 1929 (W. C. Stehr), 1 ♂. Koochiching County, VIII, 14, 1910, 1 ♂. Lake Itasca, VIII, 21, 1922 (H. H. Knight), 1 ♀. Warroad, VII, 18, 1912, 1 juv. ♂. Minneapolis, VIII, 13, 1927 (A. L. Hertig), 1 ♂. Hennepin County, VI, 12, 1910, 1 ♂.

Minneapolis and Fergus Falls are southern limits of distribution. The species is local but probably more abundant in the grassy bogs and meadows of the northern forested portions of the state.

Stethophyma lineatum (Scudder)

Koochiching County, VIII, 14, 1910, 1 ♂. Gray Cloud Island, VIII, 15, 1898, 1 ♂.

This species occurs locally in bogs and marshes over all of Minnesota. It is known from Newfoundland to British Columbia. Southern established limits are Wilmington, Delaware (material before us); Fulton County, Indiana; Matanzas Lake, Illinois (specimen before us); northern Iowa; Englewood, South Dakota (material in Amer. Mus. Nat. Hist.), and Cold Lake, Alberta.

Ageneotettix deorum (Scudder)

Eighteen males and 39 females are from Fergus Falls, Ottertail County, Fridley (sand dunes), Newport, St. Anthony Park, Ft. Snelling, Gray Cloud Island, Jordan (sand dunes), and Pipestone.

This species was recorded as the synonym *scudderi* by Lugger and Somes. Northeastern limits of distribution are Mahtomedi, Detroit, and Ada.

Oedipodinae

Arphia Stal

Both Lugger and Somes were confused by the species of this genus and many of their records can consequently not be recognized without verification.

Tho Arphia xanthoptera (with synonym *carinata*,[5] probably occurs in southern Minnesota, their records under those names all require verification.

Arphia sulphurea (Fabricius)

Lugger confused *conspersa* with this species.

[5] Lugger's specimens labeled *carinata* are representative of *pseudonietana*.

McGregor, VI, 16, 1916, 1 ♂. Taylors Falls, VI, 23, 1920 (B. Kienholtz), 1 ♀. St. Anthony Park, V, 16, 1900 and VI, 7, 1899, 8 ♂, 47 ♀. Olmsted County, VI, 1897, 2 ♀.

This is a spring species. It has a short vertex with lateral margins meeting at the apex and the wing disk is always yellow. These features easily distinguish it from the other species of the genus that occur in Minnesota, of which *conspersa* alone appears in the spring.

Duluth and McGregor are northern limits and Somes is probably correct in stating that *sulphurea* occurs in southern Minnesota to its western boundary. In the East it is found from Toronto to Sarnia, Ontario, and Lone Rock, Wisconsin, south to Leon County, Florida; Clarksville, Tennessee; Pulaski, Illinois, and Mountain Grove, Missouri (material before us).

Arphia conspersa Scudder

Lake Itasca, 1 ♀ (wing disk apricot yellow). Frazee, V, 26, 1914, 1 ♀ (wing disk grenadine). Fergus Falls, VII, 17, 1912, 1 ♀ (wing disk apricot yellow). Ottertail County, VI, 19, 1912, 2 ♀ (wing disk grenadine). Fridley, V, 28 to VI, 8, 1922 to 1925 (Hoffman; Nichol; Philip: sand dunes), 1 ♂, 3 ♀ (wing disk apricot yellow). Hennepin County, V, 24, 1920 (W. C. Cook), 1 ♀ (wing disk apricot yellow).

This species was recorded from St. Anthony Park by Lugger as the synonym *arcta*. It occurs widely through the central western portion of the state, extending north to Lake Itasca, east to St. Paul, and south to Pipestone. Though it almost certainly occurs in northwestern Minnesota, it is probably not present in the northeastern section of the state.

Arphia pseudonietana (Thomas)

Sixty-three males and 56 females were taken from July 13 to October 26 at Willow River, Pillager, Detroit, Wall Lake, Fergus Falls, Ottertail County, Wilkin County, North Branch, Anoka County, Washington County, St. Anthony Park, Ft. Snelling, Gray Cloud Island, Ramsey County, Lake City, Hennepin County, Jordan, Albert Lea, Browns Valley, Big Stone, Arco, and Pipestone.

In this series the wing disk varies from rich grenadine pink through bittersweet orange to light cadmium and buff yellow; 15 males and six females have this area yellow. The latter with exact data are from St. Anthony Park seven of 15, Washington County three of five, Lake City four of six, Ramsey County one of five, Anoka County three of nine, North Branch one of one.

Both Lugger and Somes supposed the species to be double brooded. This is incorrect, it being exclusively a summer and fall insect, their specimens taken in the spring probably all representing *conspersa*.

Lugger further mistook material of this species for *carinata* (actually a synonym of *xanthoptera*).

Willow River, Pillager, and Stephen are northern known limits and Albert Lea and Pipestone are southern limits; the species probably occurs over all but the northeastern portion of Minnesota. We have material from Amherst Junction, Wisconsin, and the species has been recorded from extreme northwestern Illinois.

Chortophaga viridifasciata (DeGeer)

Thirty-three males, 54 females (of the latter 13 brown and 41 green) taken May 16 to July 12 and 14 immatures are from Lake Itasca, Clear River, Norman County, Frazee, Friesland, Lakeland, Hamline, St. Paul, Battle Creek, St. Anthony Park, Gray Cloud Island, Frontenac, Goodhue County, La Crescent, Maple Plain, Hennepin County, Browns Valley, and Pipestone.

Encoptolophus sordidus (Burmeister)

Fifteen males and 14 females, taken July 3 to September 30, are from Washington County, St. Paul, St. Anthony Park, Ft. Snelling, Hennepin County, Detroit, Hamline, Northfield, Browns Valley, Arco, and Pipestone.

A northern limit in eastern Minnesota is Mahtomedi, but in the west the limits are considerably more northern, reaching Detroit in the north-central portion of the state.

Camnula pellucida (Scudder)

Two hundred and eleven specimens are from Cook County, Finland, Two Harbors, Lake County, Allen Junction, Duluth, St. Louis County, Harney, Wright, Koochiching County, Cass Lake, Black Duck, Crookston, Ada, Staples, Wadena, Ottertail County, Gilman, Taylors Falls, St. Paul, and St. Anthony Park.

From Ottertail County is a pair in coitu; the male this species, the female *Circotettix verrucullatus*.

Hippiscus rugosus (Scudder)

Not represented in the present collection, northern limits of this species, as given by Somes, are Fergus Falls and Mahtomedi.

Pardalophora apiculata (Harris)

Twenty-four males, 21 females, taken May 15 to July 24, and three immatures were captured at Two Harbors, Tower, Duluth, Cass Lake, Lake Itasca, Nisswa, St. Anthony Park, Ft. Snelling, Frontenac, Winona, and Hennepin County.

This species was recorded as *Hippiscus tuberculatus* by Lugger and Somes.

Pardalophora haldemanii (Scudder)

Jordan, VII, 13, 1923 (H. H. Knight, sand dunes), 2 ♀ (wing disk pink). Rock County, VI, 24, 1910, 2 ♀ (wing disk of one pink, of one yellow).

St. Paul and Fergus Falls are recorded limital northern points.

Xanthippus corallipes latefasciatus Scudder

Fergus Falls, VII, 5, 1912, 1 ♀ (wing disk yellow). Fridley, V, 28 to VI, 6, 1923 and 1925 (Philip; Hoffmann, sand dunes), 2 ♂, 1 ♀ (wing disk yellow).

This race of the northern Great Plains, reported from Minnesota incorrectly as *Hippiscus zapotecus* by Somes, is generally distributed only in the extreme western portion of the northern half of the state as far southeast as Fergus Falls. A Jordan record shows that it occurs locally in sand areas as far east as the eastern bank of the Mississippi in south-central extreme eastern Minnesota.

Dissosteria carolina (Linnaeus)

One hundred and sixteen adults taken July 6 to September 19, and eight immatures are from Koochiching County, Beltrami County, Lake Itasca, Crookston, Ada, Ottertail County, Wilkin County, Princeton, Fridley, St. Paul, St. Anthony Park, Ramsey County, Hennepin County, Blakesley, St. Peter, Big Stone County, Madison, Marshall, Arco, and Pipestone.

Spharagemon bolli Scudder

Eighteen males and 11 females, taken July 8 to August 15, are from Beltrami County, Lake Itasca, Clear River, Greenbush, Lake Pelican in Crow Wing County, Friesland, Washington County, and St. Anthony Park.

Greenbush is a northwestern point in continuous distribution, other western limits being Lake Itasca, St. Cloud, and Friesland; the species is, however, known northwestward from Aweme, Manitoba, and it is common in the Black Hills of South Dakota, though absent from all or almost all of the intervening area.

Spharagemon collare (Scudder)

Sixty males and 43 females, taken July 7 to September 30, and five immatures were secured at Cass Lake, Stephen, Crookston, Ada, Detroit, Fergus Falls, Ottertail County, Foxhome, Wilkin County, Fridley, Newport, St. Paul, Gray Cloud Island, Ramsey County, Hennepin County, Jordan, Madison, Marshall County, and Pipestone.

Varying greatly in size, this series also shows great diversity in maculation, the ground color in individuals from sand areas often being very pale.

The pronotal crest on the prozona may be straight or sinuate and we have reason to believe that Somes' Minnesota records of *"aequale"* were all based on individuals of *collare*. We therefore correct our 1925 statement as to the limits of *equale* eastward in this latitude. They are Amidon, North Dakota, and Mobridge and Pierre, South Dakota.

Scirtetica marmorata marmorata (Harris)

Lake Pelican in Crow Wing County, VIII, 6, 1906, 4 ♂, 2 ♀ [Illinois State and Hebard Cln.].

This is a record of particular interest, as the species was not previously known west of the Upper Peninsula of Michigan. These specimens are very dark and depauperate.

In the East this race is known north as far as Provincetown, Massachusetts; Gravenhurst and the Severn River, Ontario, and the Huron Mountain Club, Michigan. It reaches as far south on the Atlantic coast as North Carolina, there intergrading with *marmorata picta,* which supplants it in the southeast. The present race has not been found inland south of Douglas Lake in the Lower Peninsula of Michigan.

Trachyrhachis kiowa kiowa (Thomas)

Fergus Falls, VII, 8, 1912, 5 ♂, 3 ♀. Ottertail County, VIII, 20 and 21, 1912, 7 ♂. St. Paul, IX, 12, 1912, 4 ♂, 8 ♀. Jordan, VII, 13, 1923 and VIII, 1, 1922 (Knight; Hoffman, sand dunes), 2 ♀. Madison, VIII, 3, 1899, 3 ♂, 1 ♀.

These and 13 other specimens from Minnesota are typical except a single male from Fergus Falls, in which transition toward *kiowa thomasi* is strongly shown in its having a yellow wing disk and a weak wing band.

This is the insect reported by Lugger (and figured) and Somes as *Mestobregma cincta.* Though colonies of *kiowa thomasi* may occur in southern Minnesota, we believe that that condition will not be found typical so far north.

Known limits are Ada northward; Hinckley and Mahtomedi eastward, and Jordan southward. (We have not been able to see Somes' material, but believe that his records of this insect from Vermilion Lake, Hibbing, Duluth, and Bemidji can not safely be used without verification. We are practically certain that it does not occur at least at the first two localities.) A specimen from Ames, Iowa, typical of *kiowa kiowa* establishes another southern limital point.

Psinidia fenestralis fenestralis (Serville)

Twenty-two males, 18 females taken July 13 to August 25, and one immature were taken at Fridley, Newport, Hennepin County, Barden, and Jordan.

The series averages small and the wing disk is strawberry pink, showing very little variation in shade. Fridley and Jordan are northwestern limital points, the insect being confined to sand areas in southeastern Minnesota.

Trimerotropis pallidipennis salina McNeill

A male of this handsome insect was taken at Laporte, Hubbard County, by Mr. Donald Denning, on August 8, 1932. It constitutes not only a first record for the state but a considerable extension northeastward of the known distribution of the race.

Trimerotropis maritima interior E. M. Walker

St. Anthony Park, IX, 2, 1899, 1 ♂ (caudal tibiae very pale yellow). Gray Cloud Island, VIII, 15, 1898 and IX, 13, 1899, 12 ♂, 5 ♀ (caudal tibiae very pale yellow in six males, pink in others, but this weak in two females). Ramsey County, VII, 10, 1924 (H. H. Knight), 1 ♂ (caudal tibiae pink). Hennepin County, VII, 11, 1921 (A. T. Hertig), 1 ♀ (caudal tibiae very pale yellow).

These specimens have heavily maculate and barred tegmina, broad and heavy wing bands and the caudal femora pale with two dark bands.

Specimens are also before us from Muscatine and Fort Dodge, Iowa; the former a southern, the latter a southwestern limital point. The known northwestern limit we believe was the vicinity of St. Paul, Minnesota, but specimens have just been received from Willow Branch, in south-central Saskatchewan.

This race is known from Toronto, Ridgeway (material before us), Kingsville, Walpole Island, Sarnia, and Goderich, Ontario; St. Joseph, Port Huron, and Monroe, Michigan; Pine (specimens before us), shore of Lake Michigan and lakes in Steuben County, Indiana; Beach, Waukegan, Winnetka, and Chicago, Illinois (series before us); and Milwaukee, Wisconsin (specimen in author's collection).

It was recorded as *maritima* by Lugger and Somes and individuals with pink caudal tibiae as *citrina* by the latter author.[6]

Circotettix verrucullatus (Kirby)

Thirty-eight males and 15 females, taken July 16 to September 27, are from Grand Marais, Cook County, Baptism River, Kawishiwi River, Beaver River, Waldo, Two Harbors, Burntside Lake, Tower, Allen Junction, Duluth, Koochiching County, Grand Rapids, Cass Lake, Black Duck, Beltrami County, Lake Itasca, Warroad, Clear River, Bena, and Friesland.

Taylors Falls, Friesland, and Lake Itasca are southern limits and the latter a western limit for this boreal species, which occurs little west or south of the northeastern area of coniferous forests. It has an exceed-

[6] That species is known northwestward only as far as central Illinois.

ingly wide distribution in boreal America and has been reported from as far north as Newfoundland, Hudson Bay, Great Bear Lake, and Ft. Wrigley on the Mackenzie River (material before us). Southern limits are Gloucester and Palmer, Massachusetts; Colebrook and Canaan, Connecticut; South Sterling and North Mountain, Pennsylvania (specimens before us); Aurora, Ontario; Sand Point in Huron County, Lake George in Clare County, and Charlevoix, Michigan; Sturgeon Bay and Rhinelander, Wisconsin (material before us); Victoria Beach and Aweme, Manitoba (specimens before us); Cold Lake and Banff, Alberta; and Rolla, British Columbia (specimens before us).

Cyrtacanthacrinae

Schistocerca americana americana (Drury).

As known northern limits are Rock Rapids and Estherville, just across the state line in Iowa, we are certain that, as Somes has stated, this insect will be found in extreme southern Minnesota. The vagrant tendencies, which it shows in the fall, make this practically assured.

Schistocerca lineata Scudder

A specimen labelled "Minnesota" by Somes is before us. As we have much material from southeastern South Dakota, with a definite eastern limital point Canton, only a short distance from the boundary of Minnesota, there is good reason to believe the species occurs in the southwestern corner of the latter state.

Schistocerca alutacea (Harris)

Nineteen males, 27 females, taken July 20 to September 30, and one immature are from Friesland, Washington County, St. Paul, St. Anthony Park, Gray Cloud Island, Ft. Snelling, Ramsey County, Hennepin County, Barden, and Faribault.

In the present series all but one male and seven females have the pale dorsal stripe more or less prominent. As Somes surmised, the uniformly colored insect represents nothing more than a color phase. Lugger had recorded the two color phase as the synonyms *emarginata* and *rubiginosa*.

The species finds a northwestern limit at Friesland, being confined to southeastern Minnesota. The specimens from Barden and Washington County are the smallest we have seen (length, including tegmen, ♂ 35 to 36.3, ♀ 39 to 41.7 mm.).

The insect occurs over the eastern United States north to Manchester, New Hampshire, and Berrien County, Michigan. Records from west of the humid regions are all questionable. Though very closely related we believe *lineata* Scudder to be a valid species, supplant-

ing *alutacea* over the Great Plains. A southwestern limital point for *alutacea* is shown, by material before us, to be Doucette, Texas.

Hypochlora alba (Dodge)

Thirty-two males and 53 females, taken August 3 to 17, and four immatures are from Ottertail County, Browns Valley, Madison, and Pipestone. Part of this series was secured on *Artemisia frigida* Willd. and the species may be peculiar to that plant in Minnesota.

One female from Pipestone is fully macropterous, a very rare occurrence in this insect.

Fergus Falls, Granite Falls, and Pipestone are eastern limits, the species being confined to the extreme western portion of southern Minnesota.

Hesperotettix viridis pratensis Scudder

Anoka County, VIII, 19, 1930 (H. D. Berman), 1 ♂. Ft. Snelling, VI, 28 to VIII, 2, 1923 (Knight; Hertig), 8 ♂, 6 ♀. Fergus Falls, VIII, 1926 (M. P. Somes), 1 ♀. Browns Valley, VIII, 3, 1900, 5 ♂, 8 ♀.

Somes was incorrect in supposing that typical *viridis* would be found in Minnesota, as its distribution does not reach east of western South Dakota. The present race occupies the southern portion of the state, with northern limital points indicated by the above localities.

Hesperotettix speciosus Scudder

This distinctive species is known only from Mahtomedi, Minnesota. This record by Somes constitutes a northeastern limital point.

Melanoplus gracilis (Bruner)

Lugger and Somes found this species in southern Minnesota, northern limital points given by them being Mahtomedi and Redwood Falls.

Melanoplus viridipes viridipes Scudder

Faribault, VI, 12, 1922 (H. H. Knight), 1 ♂.

This is the first Minnesota record for the species, constituting a northwestern limital point in its distribution.

We have just received a male from Sunrise, Chisago County, where E. R. Tinkham found the species present in few numbers.

Melanoplus scudderi scudderi (Uhler)

Mahtomedi, VIII, 24, 1911 (M. P. Somes), 2 ♂ [Somes Cln.]. St. Anthony Park, VIII, 12 to IX, 30, 1899 and 1900, 4 ♂, 7 ♀. Ramsey County, X, 1910, 2 ♀.

This insect is scarce in Minnesota and confined to the southern portion of the state. We have previously not given northern limits, which are Wareham and Springfield, Massachusetts; Ithaca, New York; Washtenaw County, Michigan; and Mahtomedi and Granite Falls, Minnesota.

Melanoplus mancus islandicus Blatchley

Kawishiwi River, VIII, 30, 1919 (H. H. Knight), 3 ♂, 3 ♀. Two Harbors, VIII, 11, 1929 (W. C. Stehr), 1 ♂. Friesland, VIII, 19, 1899, 1 ♂.

This sylvan insect had not previously been recorded from Minnesota, Friesland constituting a western limit. Other western limits are Dawson Road, Whitemouth River in southeastern Manitoba, Lansing in northeastern Iowa, and Bedford and Hamburg in extreme southwestern Iowa. It should therefore be found throughout the wooded sections of Minnesota. Its distribution can not be given satisfactorily until the group is revised, but we can state that it is wide, extending east through Ontario; northern Wisconsin (Pembine, material before us); Michigan, northern Indiana, to Ohio.

Large series before us prove that *islandicus* is nothing more than a weakly defined western race of the northeastern *mancus*.

Melanoplus dodgei huroni Blatchley

Cascade River, VIII, 14, 1922 (H. H. Knight), 1 ♀. Kawishiwi River, VIII, 30, 1919 (H. H. Knight), 4 ♂, 3 ♀. Burntside Lake, VIII, 27, 1918 (V. R. Haber). Tower, VIII, 1 ,1911 (M. P. Somes), 1 ♀. Cass Lake, VIII, 7, 1911 (M. P. Somes), 1 ♂, 1 ♀. Warroad, VII, 16, 1925 (C. B. Philip), 1 ♂.

This is another addition to the Minnesota list. It is a boreal eastern sylvan race of a Rocky Mountain species occurring in probably much the same environment in the state as does *mancus islandicus*. Cass Lake and Warroad are southern limital records. It was probably this race which Somes recorded from Tower, Duluth, Bemidji, and Detroit as *blatchleyi*.

Melanoplus walshii Scudder

Thirteen males and 23 females, captured July 20 to October 19, are from Friesland, Rush City, St. Anthony Park, Gray Cloud Island, Ramsey County, Hennepin County, and Pipestone.

Northern limits are Friesland and Pipestone. The species was recorded by Lugger and Somes as the synonym *blatchleyi*, but the latter's records from northern Minnesota are probably all referable to *dodgei huroni*.

Melanoplus differentialis (Thomas)

Fifteen males and 11 females, taken August 8 to September 28, and two immature are from St. Paul, Le Sueur County, St. Peter, Big Stone, Marshall, and Pipestone.

The single immature from Big Stone is melanistic.

The species occurs northeastward to the Minnesota River valley, eastern limits being St. Paul and Big Stone County, and in Wisconsin we have it from Madison.

Melanoplus bivittatus (Say)

Forty-one males and 72 females taken June 28 to September 15 are from Grand Marais, Cramer, Finland, Kawishiwi River, Two Harbors, Tower, Duluth, St. Louis County, Burntside Lake, Koochiching County, Black Duck, Beltrami County, Lake Itasca, Warroad, Ada, Pillager, Wadena, Ottertail County, Wilkin County, Taylors Falls, Washington County, St. Anthony Park, Gray Cloud Island, Ft. Snelling, Ramsey County, Hennepin County, Jordan, Le Sueur County, St. Peter, Browns Valley, Big Stone County, and Granite Falls.

Everywhere in the state individuals with pink caudal tibiae occur, but as would be expected, such are predominant only in the northern forested section and the only kind to be found there. In all the other series otherwise colored caudal tibiae are predominant, ranging from yellowish buff and orange buff through half bluish and half yellowish to deep dull blue.

It is an established fact that individual variation in the color of the caudal tibiae is great in *bivittatus,* but that only pink caudal tibiae are to be found in material from the boreal, humid, and well wooded portions of its very wide distribution.

Melanoplus punctulatus punctulatus (Scudder)

Warroad, VII, 19, 1912 (M. P. Somes), 1 ♀. Foxhome, VII, 1912 (Howard), 1 ♀.

This is an arboreal species, difficult to locate on the trunks of trees, where it frequently rests. It is also always local in distribution.

The above are northwestern limital points. This race is known from Aylmer, Quebec (material before us), and Lake Simcoe, Ontario, south to Thompson's Mills, Georgia, being supplanted in the southeastern lowlands and apparently as far northwest as northern Texas by *punctulatus arboreus* Scudder. Another western limital point for *punctulatus punctulatus* is Omaha, Nebraska (specimens before us), and the race probably does not reach west of the wooded areas of extreme eastern South Dakota, Nebraska, Kansas, and Oklahoma, in all of which states it should be found.

Melanoplus dawsoni (Scudder)

Thirty-one males and 34 females, taken July 7 to September 14, are from Duluth, Beltrami County, Lake Itasca, Crookston, Ada, Pillager, Fergus Falls, Ottertail County, Mahtomedi; St. Anthony Park, Gray Cloud Island, Hennepin County, Brown Valley and Pipestone. Of these a female from Duluth, a male from Ada, and a pair from Browns Valley are macropterous.

Scudder's *acutus,* described from Browns Valley, is a synonym. Vermilion Lake, Black Duck, and Crookston are northern limital points.

Melanoplus gladstoni (Scudder)

Sixty-two males and 42 females, taken July 8 to October 26, are from Fergus Falls, Ottertail County, Anoka County, St. Anthony Park, Browns Valley, and Pipestone.

Abundant in southwestern Minnesota, the species was recorded by Somes as far east as Mahtomedi. That specimen is large for the species, one from Cottonwood Falls very large. Decorah and Fruitland in extreme eastern Iowa are other eastern limits shown by material before us.

Melanoplus confusus Scudder

Eighteen males and five females, taken June 15 to August 10, are from Crookston, Fergus Falls, Ottertail County, Wilkin County, Fridley (sand dunes), and Ft. Snelling.

Known northern limital points are Mahtomedi, Fridley, and Crookston, and we have material from Colfax in the extreme northwestern portion of central Wisconsin. This spring appearing species was reported by Lugger and Somes under the preoccupied name *minor*.

Melanoplus femur-rubrum femur-rubrum (DeGeer)

A very large series of this common insect is before us from the southern portion of Minnesota, where it is undoubtedly exceedingly abundant. Its distribution certainly includes all parts of the state. Specimens from Pipestone are among the smallest we have seen.

Melanoplus infantilis Scudder

Fergus Falls, VII, 16, 1912, 2 ♂. Ottertail County, VIII, 10 and 15, 1912, 8 ♂, 2 ♀. Wilkin County, VIII, 22, 1912, 1 ♂. Browns Valley, VIII, 3, 1900, 1 ♀.

Detroit, Fergus Falls, and Brown Valley in extreme western central Minnesota, are eastern limits for this diminutive species, which is abundantly distributed over the northwestern plains. Other eastern limits, shown by material in the author's collection, are Granite and Sargent's Bluff, on the northern portion of the western border of Iowa.

Melanoplus occidentalis occidentalis (Thomas)

An eastern recorded limital point of distribution is Ottertail County. Eastern limits of continuous distribution apparently lie in western North Dakota and central South Dakota. The presence of this species, like *infantilis,* is probably due to the fact that it has been able to cross the plains of southern Canada and find its way down the valley of the Red River of the North.

Though we have as yet seen no material of the species from southern Manitoba, specimens have been secured at Lethbridge, in southeastern Alberta, and we know from finding it at very high elevations in the West that it is capable of living in a very rigorous environment.

Melanoplus fasciatus (F. Walker)

Seven males and seven females, taken July 11 to August 31, are from the Kawishiwi River, Hibbing, French River, St. Louis County, Koochiching County, Cass Lake, Itasca Park, Lake Itasca, Warroad, Lake Pelican in Crow Wing County, St. Anthony Park, and Mahtomedi. A male from Koochiching County and one from Warroad are macropterous.

This widespread boreal sylvan species occurs throughout Minnesota, though in the south and west it has undoubtedly a very local and discontinuous distribution, as is certainly the case in Iowa and Missouri.

Melanoplus borealis junius (Dodge)

Seven males and 27 females, taken June 19 to August 7 are from the Knife River, Cass Lake, Black Duck, Itasca Park, Lake Itasca, Warroad, Roseau, Teien, Marshall County, Crookston, Ada, and Wilkin County.

The Black Duck, Warroad, and Roseau specimens have the caudal femora pink ventro-externally, this suggested in some of the Itasca specimens. It is clear that *junius* is a very weakly defined race. It probably occurs typical over southern Minnesota, but in the northern portion of the state individuals almost typical of *borealis borealis* are frequently found.

Four males and three females are macropterous, the others having the organs of flight slightly to (usually) considerably reduced.

This was reported by Somes as *extremus,* a synonym of *borealis borealis.*

Melanoplus mexicanus mexicanus (Saussure)

A very large series from all parts of Minnesota is before us. All have the caudal tibiae pink except a male from Willow River, in which they are buff with glaucous.

This insect was reported by Lugger and Somes as the synonym *atlanis.*

Melanoplus mexicanus migratory phase **spretus** (Walsh)

Tho it has been present in Minnesota in devastating swarms, no material of this migratory phase from the state has been preserved. It was treated as a distinct species by Lugger and Somes.

Melanoplus bruneri Scudder

Twenty-five males and 14 females, taken July 1 to August 15, are from the Kawishiwi River, Isabella River, Two Harbors, Duluth, Grand Rapids, Lake Itasca, and Warroad.

Known only as far south as Duluth, Grand Rapids, and Lake Itasca in northeastern Minnesota, this sylvan species should be found quite

generally distributed throughout the coniferous forests and possibly locally elsewhere in favorable wooded spots, as a specimen is before us from Onawa in southwestern Iowa. It is certain, however, that *bruneri* is limited in continuous distribution to northern Minnesota as far west as the forests occur solidly.

Melanoplus keeleri luridus (Dodge)

Thirty-seven males and 33 females, taken July 28 to September 26 and two immatures are from Willow River, Cass Lake, Crookston, Ada, Fergus Falls, St. Anthony Park, Ft. Snelling, Gray Cloud Island, Jordan (sand dunes), St. Peter, Browns Valley, Madison, and Redwood Falls.

Northern limits are Willow River, St. Cloud, Detroit, and Crookston.

Melanoplus packardii Scudder

Brown Valley, VIII, 3, 1900, 2♂, 1♀ [Joliet High School and Hebard Clns.].

We believe that Granite Falls alone of Somes' records of this species is correct and that all or the majority of the others were based on material of *stonei*. Limited to extreme western Minnesota, *packardii* is also known as far east as Hamburg, in extreme western Iowa. Material before us is from the Turtle Mountains, Manitoba, but large series from Aweme so recorded represent *foedus foedus*. We have also examined a male from Estevan, Saskatchewan.

Melanoplus stonei Rehn

Four males and eight females, taken July 17 to August 6, are from Cass Lake, Lake Pelican in Crow Wing County, Warroad, and Clear River.

This is the insect that Somes reported as *foedus* from Allen Junction and Lake of the Woods.

Though closely related to *foedus* Scudder, we consider *stonei* a distinct species. It would appear to be a relict, now confined largely to sandy forested areas and particularly such environment known as "Pine Barrens." Lake Pelican is a southern limit in this longitude. The species is known from the Pine Barrens of New Jersey; Godbout, Quebec; St. Ignace to the Huron Mountain Club in the Upper Peninsula and the northern portion of southern Michigan as far south as Sand Point and Crystal Lake; Lake Nipissing, Ft. William and Lake Nipigon, Ontario (letter from E. M. Walker), and Victoria Beach on Lake Winnipeg to Sprague, Manitoba[7] (material before us).

[7] The British Columbian material that we determined as *stonei* we believe represents an intensive color phase of *foedus*, found only in the northwestern portions of that insect's distribution.

Melanoplus foedus foedus Scudder

This species is readily separated from *packardii* by the fact that two of the valves of the penis are much more produced than the others, whereas in *packardii* they are all equally produced. It is subject to very great variation in size and color pattern and sometimes individuals in external appearance agree almost completely with certain individuals of *packardii*. It has an exceedingly extensive western distribution, eastern limits (from study of our very large series) being Aweme and Onah, Manitoba; Hecla and Chamberlain, South Dakota; Halsey, Nebraska; Rooks, Ellis, and Kiowa Counties, Kansas; and Muleshoe, Texas.

As Hecla, South Dakota, is only seventy miles from the western boundary of Minnesota, it is quite possible that *foedus foedus* will be found in the extreme western portion of the state, tho it appears that to the south its eastern limits are more and more to the West.

Melanoplus foedus fluviatilis Bruner

Two males and six females, taken July 8 to August 12, are from St. Anthony Park, Carver County (on river near Lawrence), Jordan, Fish Hatchery in Le Sueur County, and Sibley and Le Sueur Counties (on river near Blakeley).

The ventral surface of the caudal femora is rich orange in all but the female from St. Anthony Park, in which it is yellowish buff.

Lugger reported this insect incorrectly as *impiger* and on the basis of that record Minnesota has been incorrectly included in that species range, which in this longitude is shown by series before us to extend no further north than Bedford and Hamburg in extreme southwestern Iowa.

We reported this race from Minnesota in 1925. It is now known to reach as far north as St. Anthony Park and is probably limited to the Mississippi River and its tributaries in the southeastern portion of the state. An eastern limit is the Kinikinick River near the St. Croix River, Wisconsin, and a previously reported eastern limital point is Moline, Illinois.

Melanoplus angustipennis (Dodge)

Thirty males and 32 females, taken July 3 to September 3, are from Hinckley, Fridley (sand dunes), Gray Cloud Island, Ramsey County, and Jordan.

The caudal tibiae are pale glaucous in all but a female from Fridley, in which specimen they are pink.

Somes diagnosed the synonym *comptus,* as part of the original series came from Minnesota, and his records of *impiger* are probably also referable to *angustipennis.*

Largely if not wholly confined to open sandy areas, the species probably occurs over all except northeastern Minnesota. Eastward a northern limit of distribution is Colfax (material before us), in northwestern central Wisconsin.

Melanoplus flavidus flavidus Scudder

Four males and 15 females, taken July 20 to September 13, are from Fergus Falls, Fridley (sand dunes), St. Anthony Park, and Gray Cloud Island.

Fridley is a northern and eastern, Fergus Falls a northern, and St. Anthony Park an eastern limital point. To the south, however, the species reaches eastward to Lone Rock, Wisconsin, and Havana, Illinois, and to the west as far north as Aweme, Manitoba. It is probably confined to river bottoms in Minnesota and probably occurs only in the southern and western parts of the state.

Podisma glacialis canadensis E. M. Walker

Kawishiwi River, VIII, 26, 1919 (H. H. Knight), 2 ♂, 1 ♀. Winton, Basswood Lake, VIII, 22, 1926 (A. McIntosh), 1 juv. ♀. Burntside Lake, VIII, 24, 1918 (V. R. Haber), 2 ♂, 1 ♀. French River, VII, 29, 1912, 1 ♀, 1 juv. Willow River, VIII, 6, 1922 (H. B. Hungerford), 1 ♂.

Burntside Lake and Willow River are western limits, the latter also a southern limital point. This western race of an interesting, thamnophilous, boreal species, is known as far east as Algonquin Park, Ontario, northern limits in that province being the Temagami District and Ft. William. South it is known as far as Dickinson County, Michigan, and it will certainly be found in northern Wisconsin.

Phoetaliotes nebrascensis (Thomas)

Browns Valley, VIII, 3 to X, 26, 1897 to 1900, 3 ♂, 8 ♀, 27 juv. Pipestone, VIII, 17 to IX, 27, 8 ♂, 3 ♀, 2 juv.

Lugger used the name *nebrascensis volucris,* since placed in synonymy. Part of this material from Browns Valley was described in 1899 as Scudder's synonym *Melanoplus phoetaliotiformis.*

This species is probably limited to extreme western and southern Minnesota, the above records being limital eastward in this latitude. Southeastward it is known only from Illinois and extreme northwestern Indiana.

TETTIGONIIDAE

Phaneropterinae

Scudderia septentrionalis (Serville)

St. Paul, VIII, 20, 1930 (D. Buchanan), 5 ♂, 3 ♀. Fish Hatchery, Le Sueur County, VII, 18, 1923 and VII, 20 to 30, 1922 (W. E. Hoffmann), 2 ♂. Le Sueur County, VII, 27, 1922 (R. R. Holland), 1 ♂.

The distinctive male genitalia and exceptionally broad and weakly curved ovipositor are well figured by Lugger[8] as *pistillata,* tho his discussion is correct for that species.

This insect is much rarer than the other species of the genus. It is very wary and a rapid flyer. In addition, it is arboreal and thus much less likely to be encountered by the collector. The only specimens we have secured were attracted to a powerful light at night.

The above is a northwestern limital point in the species' wide distribution. We have also seen a male from Colfax in the northwestern portion of central Wisconsin.

Scudderia pistillata Brunner

Twenty males and 18 females, taken June 29 to August 16, are from Cramer, Isabella River, Two Harbors, Allen Junction, Sucker River, Willow River, Bena, Cass Lake, Beltrami County, Lake Itasca, Roseau County, Marshall County, Princeton, St. Anthony Park, New Farm in Ramsey County, Gray Cloud Island, St. Paul, Le Sueur County, and Albert Lea.

This boreal species occurs everywhere in Minnesota.

Scudderia curvicauda curvicauda (DeGeer)

Known as far north as central Iowa and extreme southeastern South Dakota, this race should be found in extreme southern Minnesota. Lugger's record for Minnesota was, however, based on material of *texensis.*

Scudderia texensis (Saussure and Pictet)

Hamline (Osborn), 1 ♀. St. Peter, VIII, 10, 1923, 1 ♀.

These are northern limital points for this widely distributed species, which was misidentified as *curvicauda* by Lugger and so figured in 1898. To the east we have examined material from Whitehall, in west central Wisconsin.

Scudderia furcata furcata Brunner

Forty-three males and 29 females, taken July 9 to October 6, are from Burntside Lake, Shell Lake, Ottertail County, North Branch, Anoka County, Hamline, St. Anthony Park, Gray Cloud Island, Ft. Snelling, Ramsey County, Lake Minnetonka, Crystal Lake in Hennepin County, Jordan, Le Sueur County, Albert Lea, St. Peter, and Pipestone.

Lugger reported this insect correctly as the synonym *furculata,* and as *augustifolia* (a synonym of *curvicauda*). His concept of the species of *Scudderia* was hopelessly confused, as shown by the material he studied, now before us.

Northern limits are Burntside Lake and Crystal Lake, but the distribution of the race probably includes all of Minnesota.

[8] His male is from West Point, Nebraska; his female from Ames, Iowa.

Amblycorypha oblongfolia (DeGeer)

St. Anthony Park, VIII, 18 to IX, 19, 1899, 2 ♂, 1 ♀. Gray Cloud Island, VII, 11 and 12, 1921 and VIII, 15, 1898 (Hungerford; Knight), 5 ♂. Jordan, VII, 13, 1923 (A. T. Hertig; sand dunes), 1 ♀. Albert Lea, VIII, 9, 1921 (W. E. Hoffman), 1 ♂. St. Peter, VIII, 3, 1922 (R. R. Holland), 1 ♀.

The full figure of a male was given by Lugger as *Scudderia furculata* (fig. 139) in 1898, tho the genitalia so designated were from a specimen of *furcata furcata.*

Jordan and St. Peter are northern limits of distribution.

Amblycorypha rotundifolia iselyi Caudell

Known from Lake Hendricks, South Dakota, practically on the Minnesota line, this race is almost certain to be found in the southwestern corner of Minnesota.

No material is before us from this state, tho Lugger remarked that it was common (his *rotundifolia* probably representing this race, as the typical race is not known northwest of Illinois).

It is certain that the specimen of *Amblycorypha uhleri,* which Lugger stated was labelled "Minnesota," was so marked erroneously. The species is not known northwest of Wyandotte, Indiana.

Microcentrum rhombifolium (Saussure)

This species was recorded from Winona by Lugger as *rhombifolium.* No material from Minnesota is before us.

It occurs throughout the eastern United States north to Long Island and Staten Island, New York; Lafayette, Indiana; Michigan; Madison, Wisconsin (material examined by us); Winona, Minnesota; and St. Libory, Nebraska (specimen before us).

Pseudophyllinae

It is probable that none of the species of *Pterophylla* occur as far north as Minnesota in this longitude. Lugger discussed *Cyrtophyllus concavus,* a synonym of *Pterophylla camellifolia* (Fabricius), but did not have material from this state.

Copiphorinae

Neoconocephalus robustus Scudder

Recorded from White Bear Lake and Lake Minnetonka by Lugger as *robustus,* we have not seen Minnesota material of this species. These are northern limits of distribution. As series from Illinois indicate that

robustus robustus occurs there in sand areas but *robustus crepitans* elsewhere, we can not determine which of these very closely related races is present in Minnesota.

Neoconocephalus ensiger (Harris)

No material of *nebrascensis* from Minnesota is in the Lugger Collection, though there is there a male from West Point, Nebraska. We believe that Lugger mistook Minnesota specimens of *ensiger* for that species in which the vertex was more extensively darkened than is usual. It is, however, true that *nebrascensis* may occur in extreme southern Minnesota.

Fifteen males and 24 females, taken July 13 to September 30 and five immatures are from St. Paul, St. Anthony Park, Ft. Snelling, Gray Cloud Island, Jordan (sand dunes), Mankato, Browns Valley, and Madison. All are green except a St. Paul and a Brown Valley female, which are light brown.

Northern limital points are St. Anthony Park and Brown Valley.

Conocephalinae

Orchelimum vulgare Harris

Lugger's figures are excellent for the species, but he undoubtedly confused *gladiator* with it, a species having a much more extensive distribution in Minnesota. Caulfield's records from Montreal, Quebec, and the north shore of Lake Superior were certainly based on material of that species. Lugger's record of *glaberrimum* for Minnesota is an error, as that species west of the Applachians is known only from Alabama and Mississippi. Our records in 1925 from eastern Wyoming and Manitou, Colorado, were due to mislabelling in the Bruner collection.

St. Anthony Park, VIII, 12 and IX, 5, 1899, 1 ♂, 3 ♀ (two males macropterous). Gray Cloud Island, VIII, 15, 1898, 1 ♂. Powder Plant, Ramsey County, VII, 21, 1921 (W. E. Hoffmann), 1 ♂. St. Peter, VII, 27, 1922 (W. E. Hoffmann), 1 ♂.

Beloit, Wisconsin (from material we have examined) and the above records are limits northward, other northwestern limits being Big Stone and Mobridge, South Dakota. Walker's extreme northern record, from Muskoka Lake, Ontario, we have been able to verify through the kindness of that author.

The species is usually larger and quite distinct in appearance from *gladiator*, but in the narrow northern areas where the ranges of these two overlap the general similtarity of appearance in males is very great. They are, however, readily separated by the characters given by Rehn and Hebard in 1915.[9]

[9] Trans. Amer. Ent. Soc., XLI, p. 24.

Orchelimum gladiator Bruner

Twenty-one males and 20 females, taken July 9 to August 22, are from Crookston, Staples, Pelican Rapids, Wilkin County, Princeton, White Bear, St. Anthony Park, and Hennepin County.

Monona Lake, Wisconsin (from a female examined by us), and St. Anthony Park, Staples, and Pelican Rapids, Minnesota, are known southern limits of distribution, but the species quite probably occurs throughout Minnesota except in the extreme southeastern portion, as to the west it is known from southern Manitoba to south central Nebraska.[10]

Orchelimum nigripes Scudder

Recorded by Lugger from along the Mississippi River in Minnesota, this distinctive species is probably confined to the margins of lakes, streams, and rivers in the extreme southeastern portion of the state. No material is in the Lugger collection, but Lugger's comments strongly indicate that he knew and recognized the insect from there.

Orchelimum concinnum delicatum Bruner

Two males and four females, taken July 21 to August 2, are from Ottertail County, Wilkin County (10.2), Princeton (10.1), Browns Valley (9.3), and Heron Lake (10.4). The ovipositor length for the female from each locality is given in parentheses. The Ottertail County male shows faintly, the Princeton female more strongly, a vertical facial band.

Wilkin County is a northern limital point, Princeton an easternmost, and that locality and Heron Lake constitute known southern limits for this western race.

Lugger stated that *campestre,* a synonym of *concinnum concinnum,* had been reported from southeastern Minnesota. The species probably occurs there, but material must be seen before it can be determined which of the races is represented, a region possibly in the area of intergradation between the two.

Conocophelus fasciatus fasciatus (DeGeer)

Sixty-six males and 90 females, taken July 12 to September 26, are from numerous localities in Minnesota. This very common species is found over all portions of the state, but it is undoubtedly most abundant in the southern half.

Conocephalus brevipennis (Scudder)

St. Anthony Park, IX, 3 and 19, 1899 and 1923, 3 ♂, 6 ♀. Gray Cloud Island, VIII, 13, 1898 and IX, 13, 1899, 4 ♂, 22 ♀. Ft. Snelling, VIII, 14, 1919 (H. H. Knight), 1 ♀. Madison, 1 ♀. Marshall, IX, 30, 1917, 1 ♀. All are brachypterous in this series.

[10] The published Douglas County, Kansas, record was based on material of *Orchelimum silvaticum* McNiell.

Lugger apparently recorded this species both correctly and as the emended synonym *ensiferum*.

St. Anthony Park and Madison are northern limits, the species being undoubtedly confined to southern Minnesota.

Conocephalus nemoralis (Scudder)

Lugger recorded this species from Minnesota as rather common, but no material is in his collection or has any subsequently been taken there. We believe that it will there be found, however, tho limited to wooded areas in the southern portion of the state.

Conocephalus strictus (Scudder)

Thirteen males and 23 females, taken July 9 to September 13, and nine immatures are from St. Anthony Park, Ft. Snelling, Gray Cloud Island, Minnehaha Creek in Hennepin County, and Marshall.

This species, preferring open grass lands of poor soil, is likewise limited to southern Minnesota, northern limits being Hennepin County and Marshall. We have seen it from Wisconsin only as far north as Madison.

Conocephalus nigropleurum (Bruner)

Seven males and one female, taken July 9 to August 18, and two immatures are from Red Rock, Gray Cloud Island, Crystal Lake in Hennepin County, and Minnehaha Creek in Hennepin County.

These are northern limits for this handsome species, which probably occurs locally in bogs and marshy spots across southern Minnesota. We have seen an immature from Madison, Wisconsin, constituting an eastern limit.

Conocephalus attenuatus (Scudder)

Figured and correctly diagnosed by Lugger, he stated that a few specimens had been taken in Minnesota. We have not seen material from there, where the species is undoubtedly limited to the southern portion of the state.

Conocephaus saltans (Scudder)

Eight males and 24 females, taken August 1 to 22, are from Foxhome, Ottertail County, St. Anthony Park, Jordan (sand dunes), Brown Valley, Madison, and Pipestone. In this series all are brachypterous except four macropterous females.

Jordan and Foxhome are northern limits of this insect, which in southern Minnesota is probably confined to areas of poor soil and sand but in the west reaches much further north and is probably much more generally distributed.

It was reported by Lugger as the synonym *Xiphidium modestum*.

Decticinae

Atlanticus testaceus (Scudder)

This insect was well diagnosed and figured by Lugger as *pachymerus,* a southeastern species with which it was long confused.

St. Anthony Park, VII, 1, 1899, 1 ♀. Highwood, VII, 23, 1918 (W. A. Riley), ♀.

St. Anthony Park is a northwestern limit for this species, which is known north to Marion and Brookline, Massachusetts; Arner, Ontario, and the Huron Mountains and Porcupine Mountains of the Upper Peninsula of Michigan. Southward it reaches Lane, South Carolina (material before us); Mammoth Cave, Bee Spring, and Tyrone, Kentucky; Crawford County, Indiana, and Peoria, Illinois.

It is highly improbable that *Atlanticus davisi* Rehn and Hebard will be found as far north as Minnesota, its known northwestern limit being Keokuk, in extreme southeastern Iowa. Lugger, referring to the insect as *dorsalis* (a name actually applying to a distinct species), suggested that it might occur in Minnesota.

Anabrus simplex Haldeman

Kittson County, VII, 17, 1931 (A. G. Ruggles), 1 ♀.

Recorded and figured from Argyle, Minnesota, by Lugger as the synonym *purpurascens,* that locality constitutes a northeastern limital point, well east of its other known eastern limits of distribution. It is evident that the Red River Valley has enabled a number of western species to reach further eastward than is elsewhere possible.

Rhaphidophorinae

We are deeply indebted to T. H. Hubbell for the following data on this subfamily. That author's monograph on the species of the Rhaphidophorinae found in the United States and Canada is now nearing completion. We have added to his information a few of the Minnesota records of *Ceuthophilus maculatus* and those of *C. latens* and *C. fusiformis,* as, through the receipt of material and data on these species from him, we are now able to make these determinations with accuracy.

The members of this subfamily have evidently been very inadequately collected in Minnesota, as only four species are definitely known from the state and one of these is adventive. Since the transition between the coniferous and the deciduous forest regions of the east and the prairie and plains regions of the mid-west occurs in this territory, representatives of several eastern and Great Plains groups should reach their limits of distribution within the boundaries of the state. Intensive

field work, and especially systematic collecting with molasses traps,[11] will undoubtedly add a considerable number of species to the Minnesota list, and may result in unlooked-for discoveries.

[11] The use of molasses traps often reveals the presence of *Ceuthophilus* and related forms in abundance where their occurrence was scarcely suspected. Trapping is the only method yet discovered for obtaining these insects in large series with a reasonable amount of effort. However, specimens collected in this way are of poor quality unless the molasses is thoroly removed from their digestive tract as well as from their exterior before they are pinned and dried. Since the technic of molasses-trapping on a large scale and the proper preservation of material thus obtained, though simple, is apparently not generally known to collectors, the methods I have developed in the course of several years of work on the Rhaphidophorinae are given here. Cockroaches, beetles, phalangids, and other arthropods are also obtained in great numbers in the traps.

Pint Mason jars with screw tops are used as traps. The bait is molasses diluted one-half with water, and with fusel-oil added as an attractant in the proportion of one teaspoonful to about a gallon of the diluted molasses; half an inch to an inch of the bait in the bottom of each jar is sufficient. The jars are handled in units of eight, as a milk-bottle carrier holding this number is the most convenient method of carrying them about. By experience I have found that sixteen traps to a single collecting site is a satisfactory number except where material is very scarce. The traps are buried in the ground with their openings even with the surface; where this is not feasible, as in rocky situations, stones or leaves may be piled around the jars to give access to the brim. A small trenching spade saves much time in placing the traps. They should be spaced not less than ten feet apart, and are best placed near piles of brush, hollow logs, or other covers in woods, or near the openings of mammal burrows and other situations offering concealment in prairie and plains environments. Red or white squares of cardboard placed on trees or bushes near the traps serve to mark their location and prevent loss. In cool weather the traps may be left out as long as a week, but in warm weather and in situations where they are exposed to the sun during the day specimens should be removed from them every two or three days.

The traps are collected with the milk-carriers, and their contents poured back into the bait-can through a small square of cheese cloth placed in a tea strainer. A piece of paper on which the data have been written with a soft lead pencil is placed with the specimens and the cheese-cloth tied with string to form a small bag. The bags are washed, preferably in running water, until all the molasses except that swallowed by the insects has been removed. They are then dropped into a large can of 70% to 80% alcohol. After a time this alcohol will become brown with molasses which has diffused out of the specimens; it is replaced with more dilute alcohol (50% to 60%), and if necessary this is followed by a third change. It may require several weeks for the nearly complete removal of the molasses in this way; but this is essential, as if any remains in the crop it soaks out through the tissues of the dried specimen, causing it to rot and become discolored, and corroding the pin. Finally the bags are placed in 95% alcohol to harden the contained insects. The specimens may be removed from this last and pinned directly if desired, but the following process produces much better ones.

The lots of material are dehydrated and cleared in xylol as if being prepared for microscopic whole mounts, though the process may be greatly abbreviated. I have found the following steps sufficient in most cases, the material being left 12 to 24 hours in each fluid: a second change of 95% alcohol; 2 changes of absolute alcohol or water-free acetone or synthetic methyl alcohol (the last being equally satisfactory and much less expensive); xylol. If the specimens do not become translucent in appearance with the addition of the zylol they are not completely dehydrated, and should be returned to the preceding stage. This clearing process serves a double purpose—it removes the soluble fats and oils from the body of the insect, oxidation and decomposition of which are the chief causes of the discoloration so often seen in old specimens; and it hardens and toughens the soft tissues in such a way that when the insects are pinned and dried there is very little shrivelling and distortion. Even the membranous portions of the body, such as the genital folds, cerci and weakly sclerotized portions of the mouthparts maintain their form, supported by the spongy, fibrous tissues within. While still wet with the zylol, the appendages can be moved and arranged in position; after drying they are as rigid as in a specimen prepared by ordinary methods, tho they may be relaxed in the usual manner. A xylol-treated specimen is clean and bright-looking, the form much better preserved than usual, and such a specimen appears to be less fragile and should be more permanent than an average dried specimen. The method is well adapted for the preparation of pinned specimens of other relatively soft-bodied insects, and is especially applicable to the nymphs of Orthoptera. Its chief disadvantages are that it fades green colors to white, and that it brings out the dark color pattern in somewhat greater than normal contrast, the bleached internal tissues showing through the more transparent portions of the integument. I am indebted to H. S. Barber, of the United States National Museum, for suggesting the method to me.

Tachycines asynamorus Adelung

Lugger recorded this species from Minnesota under the name *Diestrammena marmorata* (DeHaan), by which it was long incorrectly known. He states that this adventive Asiatic species became established in the conservatory at the state University about 1894. Professor Oestlund's notes, quoted by Lugger, imply that the species was introduced from Florida, but this is unlikely, as it has never been taken in that state, and on the other hand has long been a pest in greenhouses in the north. Hebard discussed the distribution of the species in 1925, and pointed out the synonymy of *Diestrammena japanica* Blatchley.

St. Anthony Park, IX, 28, 1920 (H. H. Knight), 1 ♀. University Farm, St. Paul, IX, 7, 1929 (C. T. Schmidt), 1 ♀. St. Paul (Lugger collection), 1 ♀.

Ceuthophilus maculatus (Harris)

Eleven males and 12 females, taken July 20 to September 14, and eight immature individuals are from "Lake Superior" (labelled *lapidicolus* by Lugger), Wright, Lake Itasca, Norman County, Pillager, Battle Lake in Ottertail County, St. Anthony Park (labelled *lapidicolus* by Lugger), Lake Sylvia in Wright County, Minneapolis, St. Peter, and with no locality (labelled *blatchleyi* ? by Lugger).

Altho Lugger in 1898 listed four species of *Ceuthophilus,* all presumably from Minnesota, study of the literature and of a part of his original material indicates that all of these records were probably based upon specimens of the single species *Ceuthophilus maculatus.* No definite locality records were given for any of them, but Lugger stated correctly of *maculatus* that "this is our most abundant species, quite common under decaying wood, loose bark, and under stones." The other three species listed by Lugger are *C. blatchleyi* Scudder, *C. "lapidicolus"* (Burmeister), and *C. gracilipes* (Haldeman). The first of these is a synonym of *C. uhleri* Scudder, which probably does not reach even southern Minnesota, its known northern and northwestern limits extending through central Ohio, north central Indiana, and northwestern Illinois, and out along the streams into the prairie region as far as Fort Dodge in central Iowa. A male without locality in the Lugger collection labelled *"C. blatchleyi?"* is a typical specimen of *maculatus.* In Scudder's 1900 checklist, *Ceuthophilus blatchleyi* is attributed to "Minn.", evidently on the basis of Lugger's inclusion of this species in his paper. Washburn has also recorded *C. blatchleyi* from an unspecified locality in Minnesota;[12] the probability that this record was based on material of *maculatus* becomes almost a certainty if the illustration of *"Ceutophilus* sp." given in plate III, figure 4, of his report was made from

[12] Fourteenth Rept. State Ent. Minn. for 1911, p. 13 (1912). Washburn's plate showing *Ceuthophilus* sp. was republished by Somes (1914) in his paper on the Acrididae of Minnesota.

one of his specimens. It evidently represents *C. maculatus,* though rather poorly.

Lugger's inclusion of *Ceuthophilus "lapidicolus"* (Burmeister) in the Minnesota list was also based on erroneously determined material of *maculatus.*[13] Two of Lugger's specimens bearing the label *"C. lapidicolus"* have been seen, both of which are *maculatus.* Lugger's illustration (Fig. 164) is not very good, but agrees with specimens of *maculatus* in general proportions and details of coloration. It has been reproduced as *Ceuthophilus lapedicolus* by Kellogg (Amer. Insects, p. 155, Fig. 215).

The fourth species listed by Lugger, *Ceuthophilus gracilipes* (Haldemen), almost certainly fails to reach Minnesota. Its known northern and northwestern limits extend through central Ohio and Indiana and southern Illinois. A female in the Hebard collection is labelled Fairbury, Nebraska, but the locality is probably erroneous. Northward in Michigan and southern Ontario the species is replaced by the allied *Ceuthophilus meridionalis* Scudder. Its inclusion in the Minnesota list by Lugger was evidently due to Scudder's record of *gracilipes* from Minnesota in 1894; study of the two males and one female in the Scudder collection upon which this record was based shows that they are *maculatus.* A similar misidentification by Scudder of material of *maculatus* from Manitoba led E. M. Walker to include *gracilipes* in a paper on the Orthoptera of that region in 1910, and Blatchley's 1920 account of the species perpetuates these errors.

In 1894 Scudder recorded *Ceuthophilus terrestris* Sc. (shown by Hubbell in 1929 to be a synonym of *brevipes* Scudder) from North Red

[13] The identity of *Phalangopsis lapidicola* Burmeister 1838 has long been a matter of speculation. The uncertainty with regard to the proper application of this name is well shown by the fact that it has been used by different authors for at least eight species belonging to three different genera. Stability of nomenclature in the genus *Ceuthophilus* is dependent upon the proper identification of Burmeister's species, the oldest in the genus. It is therefore gratfying to be able to state that through the kindness of Dr. Willy Ramme, of the Berlin Museum, and Dr. H. H. Karny, of Buitenzorg, Java, I have been allowed to study what purports to be Burmeister's original material.

Two specimens were submitted to me. The first of these is an adult female bearing the number 3711, and on a green label "Carolin. Germ[ar]". It is evidently the second of the two specimens mentioned in the original description, though it agrees only in part with the description, which was evidently drawn up from both specimens. It is a typical example of the species described in 1920 by Blatchley on page 625 as *Ceuthophilus davisi* on the basis of immature specimens, and on page 626 as *C. rehebi* from mature specimens. Since the other specimen mentioned by Burmeister cannot be located and is not known to exist, I hereby designate the female from "Carolin." [South Carolina] as the lectotype of the species, thus placing *C. davisi* Blatchley and *C. rehebi* Blatchley in the synonymy of *C. lapidicola* (Burmeister).

The other specimen received from the Berlin Museum is an immature female of *Ceuthophilus gracilipes* (Haldeman), bearing the number 1039, and the data "Amer. sept.—Coll. Charp[entier]." It evidently cannot be Burmeister's first specimen, which was from Germar's collection, and came from Virginia.

Karny had already studied these two specimens, and had selected as type (by label) the specimen here designated the lectotype, tho he had incorrectly determined it as *Ceuthophilus gracilipes.* The species to which the name *lapidicola* has commonly been assigned in recent years by Scudder (in part), by Rehn and Hebard, and by Hubbell, must be known by the name *Ceuthophilus pallidipes* E. M. Walker 1905.

River [probably Manitoba], a record repeated in Walker's 1910 list. The original material has not been found, but in view of the facts that *brevipes* is not known to reach so far west, that *maculatus* is common in the vicinity of the Red River, and that Scudder's type series of *terrestris* included a misidentified female of *maculatus* from Maryland, it appears probable that this record was also based on *maculatus*. Authentic western limital records of *C. brevipes* are Isle Royale in Lake Superior, Hazelhurst in Oneida County and Madison in Dane County, Wisconsin, and Vigo and Lawrence Counties in Indiana. The species may reach the eastern part of Minnesota. Karny's 1928 record of *terrestris* from Glen Souris, Manitoba, is probably attributable to *maculatus*.

Ceuthophilus maculatus (Harris), the genotype, has a wide range in the northern United States and southern Canada east of the Great Plains region. The extent of its distribution may be indicated as follows: New Brunswick and Quebec westward north of Lake Superior to Winnipeg in Manitoba, south through eastern North Dakota (Devil's Lake), eastern South Dakota (Springfield), eastern Nebraska (West Point), and northern Missouri, to West Helena on the Mississippi River in Arkansas, thence northeastward through southern Illinois, following the north shore of the Ohio River to western Pennsylvania, and extending south on the Atlantic Coast to the vicinity of Washington, D. C. In southernmost Ohio and north central Kentucky it is apparently replaced by the very closely allied but distinct *Ceuthophilus tenebrarum* Scudder.

Ceuthophilus latens Scudder

1862. C[*euthophilus*] *latens* Scudder, Proc. Boston Jour. Nat. Hist., VII, p. 437 [♀ , Illinois.]

Hennepin County, VII, 17, 1927 (G. A. Mail), 2 ♂.

This species has a wide range in the northeastern United States. The above is a northwestern limital point in its distribution.

Ceuthophilus silvestris Bruner

This diminutive species has been recorded (Hubbell in Hebard 1931: 207) from Ottertail County, Minnesota, on the basis of a male in the Lugger collection. An immature female in the same collection from Hamline, Ramsey County, appears also to belong to this species. The synonymy of *Ceuthophilus marshalli* Caudell was established and the known distribution of the species outlined by Hubbell in the reference given above.

The above are northern limits known for this insect.

Ceuthophilus fusiformis Scudder

St. Paul, V, 22, 1922 (W. E. Hoffmann; caught with meat for bait), 1 ♂.

The dorsal lobes of the pseudosternite in this male fuse at their bases and are subconical with sharply rounded apices, the interval between being sharply rounded rectangulate.

The above is a northeastern limit for this insect, which is widely distributed westward to and including the Rocky Mountains, from Manitoba, Saskatchewan, and Alberta south to Oklahoma and New Mexico.

Any or all of the following species of *Ceuthophilus* may yet be discovered in Minnesota, the probability of this being greater in the case of some than in that of others: *C. brevipes* Sc., *C. seclusus* Sc., *C. pallidus* Thos., *C. divergens* Sc., *C. pallescens* Br., and at least two as yet undescribed species known to occur in adjacent regions.

Udeopsylla robusta (Haldeman)

1850. *Ph*[*alangopsis*] (*D*[*aihinia*]) *robusta* Haldeman, Proc. Amer. Asso. Adv. Sci., 2nd Meeting, p. 346 [North America].

1925. *Udeopsylla robusta* Hebard, Proc. Acad. Nat. Sci. Phil., 77: 145-146 [Synonymy and distribution].

The Lugger collection contains the following material of this large, robust, reddish-brown to blackish Rhaphidophorid.

St. Anthony Park, Ramsey County, July 27 (O. Lugger), 1 ♀, Hamline, Ramsey County, 1 juv. ♂, 1 ♀, Ramsey County, 1 juv. ♂, "Minnesota," 1 ♂, 1 juv. ♂ [Hebard Cln.].

The larger, lighter-colored specimens in this series are labelled *U. robusta,* the smaller and darker ones *U. nigra* Sc., one of the numerous synonyms of this variable species. Lugger recorded the species under both names, giving Hamline and the Red River Valley as localities for *nigra.* Washburn[14] reported the species as *Ceuthophilus devius* Sc., another synonym, from an unspecified locality, possibly in the vicinity of Fergus Falls.

St. Anthony Park is an eastern limital point, the insect probably being more plentiful and generally distributed in the western portions, local, and largely limited to sand areas in the southeastern portions and absent from the northeastern portions of the state.

GRYLLIDAE

Gryllinae

Gryllus assimilis Fabricius

Thirty-four males, 40 females and 23 immatures are from many localities in Minnesota, this common species occurring over the entire state.

[14] Jour. Econ. Ent., 5:117 (1912); Rept. State Ent. Minn. for 1911, p. 13 (1912).

The neglectus and pennsylvanicus variants are about equally numerous, only a few representing the luctuosus variant.

The species was recorded as the synonyms *abbreviatus* and *pennsylvanicus* by Lugger.

The average size is small, specimens from Stewart and Foxhome being decidedly the smaliest we have ever seen.

Gryllus domesticus Linnaeus

University Farm, St. Paul, IV, 26, 1921 (H. O. Lund), 1 ♂ ; VIII, 21, 1926 (C. T. Schmidt), 1 ♂. St. Anthony Park, IX, 9, 1896 (O. Lugger), 1 ♀. Minneapolis, VI, 16, 1919 (H. H. Knight), 3 ♂.

These are northwestern limits in the new extensive area of established distribution of this Old World domiciliary species.

Nemobiinae

Nemobius fasciatus fasciatus (DeGeer)

Twenty-seven males, 51 females, and eight immatures are from Duluth, Ottertail County, Taylors Falls, Washington County, St. Paul, St. Anthony Park, Gray Cloud Island, Red Wing, Hennepin County, Jordan (sand dunes), Brown Valley, and Marshall.

This common insect undoubtedly occurs over all of Minnesota. It was reported by Lugger as *fasciatus,* form *vittatus* and *socius.* Five males and one female from St. Louis County, Lake Itasca, North Branch, and Hennepin County are not typical, the tegminal reduction suggesting *fasciatus tinnulus* Fulton. We have submitted this series to that author, who writes that he does not believe the material should be assigned to that race.

Nemobius griseus griseus E. M. Walker

1904. *Nemobius griseus* E. M. Walker, Canadian Ent., XXXVI, p. 182, pl. 4, figs. 1 and 2. [♂, ♀ ; Toronto, Lake Simcoe, and Sarnia, Ontario.]

Ottertail County, VIII, 15, 1912, 1 ♀. Jordan, VIII, 1, 1922 (W. E. Hoffmann, sand dunes), 1 juv. ♀.

Northern limits of this sand-loving northern race are Brunswick, Maine; Toronto and Lake Simcoe, Ontario; and Douglas Lake, Michigan (material before us). It has been recorded as far south as North Haven, Connecticut, and Crawford County, Indiana. It probably occurs over all but the northern portion of Minnesota.

Nemobius carolinus carolinus Scudder

University Farm, St. Paul, VII, 25, 1921 (W. E. Hoffmann; at light), 1 ♂, 1 ♀ (male macropterous). Red Wing, IX, 30, 1923 (R. W. Dawson), 1 ♂.

A northern limit of distribution is St. Paul. This race was recorded by Lugger as *exiguus,* a name which had been frequently so misapplied.

Oecanthinae

Oecanthus augustipennis Fitch

Recorded as common in Minnesota by Lugger, we have seen no material of this widespread species from the state.

Oecanthus niveus (DeGeer)

Fergus Falls, VIII, 30, 1911 (J. Zetek), 1 ♀. St. Paul, VIII, 15, 1922 (A. Hertig), 1 ♀. Ottawa, VII, 18 and 19, 1922 (W. E. Hoffmann), 1 juv. ♂. St. Peter, VIII, 10 and 16, 1922 and 1925 (Kipperley; Holland), 2 ♂.

St. Paul is a northern limital point.

Oecanthus nigricornis quadripunctatus Beutenmuller

Nine males and six females are from Beltrami County, Ottertail County, Washington County, Hamline, St. Paul, Jordan (sand dunes), and Madison.

These specimens are all of the normal type, more slender than the average in typical *nigricornis.*

Probably occurring over all but northeastern Minnesota, Beltrami County is a northern limit for this race. Lugger did not recognize races and recorded and figured the species as the then often-misapplied name *fasciatus.*

Oecanthus nigricornis nigricornis F. Walker

Twenty-nine males and 35 females are from Pelican Rapids, Ottertail County, North Branch, St. Anthony Park, Lake City, Jordan (sand dunes), Le Sueur County, Albert Lea, St. Peter, Marshall, and Arco.

North Branch and Pelican Rapids are northern limital points. With few exceptions the series is robust, the Le Sueur County specimens (14) and some from North Branch and Ottertail County having the antennae suffused and a medio-longitudinal pronotal suffusion. Only the male from Jordan and the male from Marshall are very small. The antennal markings (according to Fulton's classification) are class 7′ to 9′, except the large and heavy Pelican Rapids female which is class 5.

Oecanthus latipennis Riley

Figured and recorded as uncommon in Minnesota by Lugger, there is no material in his collection and we have seen no specimens from the state.

Trigonidiinae

Anaxipha exigua (Say)

This species was figured and recorded from the Mississippi River (undoubtedly in extreme southeastern Minnesota and a northern limit) by Lugger under the misapplied name *pulicarius*. No specimens are in his collection and we have not seen material from Minnesota.

Eneopterinae

We do not believe that *Orocharis saltator* Uhler, figured and recorded doubtfully as from Minnesota by Lugger, will be found in the state.

Myrmecophilinae

Though *Myrmecophila nebrascensis* was named and figured and so inadvertently described by Lugger, this material came from West Point, Nebraska. The species may occur in western Minnesota, but can not yet properly be included in a list for the state.

Gryllotalpinae

Gryllotalpa hexadactyla Perty

Eleven females taken May 25 to August 28 and 13 immatures are from North Branch, Stillwater, St. Paul, Farmington, Minneapolis, Lake Minnetonka, Crystal Lake in Hennepin County, Waconia, and Clear Lake.

North Branch and Clear Lake are northern limits, the species being known only from southeastern Minnesota.

Tridactylinae

Tridactylus apicialis Say

This species was recorded as the synonym *terminalis,* and recorded from Ft. Snelling and figured as *apicalis* by Lugger. That locality constitutes a northern limit of distribution. We have not seen material from Minnesota.

Tridactylus minutus Scudder

It is probable, as suggested by Lugger, that this species will be found in southern Minnesota.

ADDENDA

During the season of 1932 large series of Orthoptera were secured for the University of Minnesota. These have been forwarded to us for study, but too late to be included in the foregoing report. We have added here all the important records, however, and note that four species and a race are added,[15] bringing the total for Minnesota up to 129 species and races.

[15] Of these one occurs east and west, while four are western.

To page 21. **Diapheromera femorata** Say

Four males, 5 females, and 2 immature individuals were secured July 30 to September 28, 1932, at Laporte, Nisswa, Andover, and Republic.

Laporte is another limital point northward for the species.

To page 24. **Pseudopomala brachyptera** (Scudder)

Taylors Falls, VII, 10, 1932 (E. R. Tinkham), 1 ♂.

To page 24. **Opeia obscura** (Thomas)

Twenty-nine males and 35 females were taken from August 5 to 7, 1932, at Browns Valley, Graceville, Morris, and New Prairie.

To page 26. **Stethophyma gracile** (Scudder)

Findlayson, Pine County, VII, 15, 1932 (E. R. Tinkham), 1 ♂.

To page 26. **Stethophyma lineatum** (Scudder)

Four miles west of Blackhoof, Carlton County, VII, 16, 1932 (C. E. Mickel), 1 ♀. Republic, Anoka County, VII, 30, 1932 (C. E. Mickel), 1 ♂, 1 ♀.

To page 27. **Arphia sulphurea** (Fabricius)

Lake Pepin, VII, 9, 1932 (E. R. Tinkham), 1 ♀.

To page 28. **Encoptolophus sordidus** (Burmeister)

Six males and 4 females, taken August 5 and 7, 1932, are from Westport, Sedan, New Prairie, White Park, Alberta, Chokio, Childs, Westport, and Graceville.

As we noted in 1925 for material of this species from the southern half of South Dakota in its extreme eastern portion,[16] these specimens again show definite consergence toward *E. costalis* (Scudder), but in none of the present cases is the assignment to *sordidus* uncertain and we still believe that two species rather than geographic races should be recognized.

Encoptolophus costalis (Scudder)

Stephen, VIII, 5 and 6, 1932 (J. D. Winter), 3 ♂. Browns Valley, VIII, 7, 1932 (E. R. Tinkham; on gravelly hills), 2 ♂. Beardsley, VIII, 7, 1932 (C. E. Mickel), 1 ♀.

These are the first records for this Great Plains species from Minnesota, where it will probably be found only over a narrow strip on the western border of the state. Stephen and Beardsley are eastern limital points. In that area it is probably confined to the drier areas, *sordidus* being also present there in the spots of richer vegetation (as we have material clearly referable to both these species from Browns Valley).

[16] Proc. Acad. Nat. Sci. Phila., LXXVII, p. 75.

As noted under *sordidus,* it is difficult to distinguish some of the material from the areas where both these species occur, although elsewhere over their enormous ranges they are widely distinct in appearance. The smoother appearance, with tegmina generally more glossy and tegminal markings often more solid aids in recognizing *costalis.*

To page 29. **Pardalophora haldemanii** (Scudder)

Five males and 4 females, taken June 22 to July 15, 1932, are from Alma Lund, Farmington, and Luverne. The wing disk is pink in two pairs, yellow in the others.

Alma Lund extends the known distribution of the species a short distance northward.

To page 29. **Xanthippus corallipes latefasciatus** Scudder

Fridley, V, 15, 1931 (F. C. Miller), 1 ♀. Savage Trout Stream, Scott County, VI, 14, 1932 (E. R. Tinkham), 1 ♂.

To page 32, before Cyrtacanthacrinae.

BATRACHOTETRIGINAE

Brachystola magna (Girard)

Ortonville, Big Stone County, VIII, 1932 (R. H. Hoberg), 1 ♀. Madison (taken by the County Agent), 3 specimens (lost through decomposition).

The first specimen was taken on the shore of an old lake bed a short distance south of Ortonville. The spot is probably on the Moraine ridge which skirted the east side of Big Lake (in post-glacial times the outlet of Lake Agassiz).

These are surprising records, for *magna* is so large that individuals could hardly be overlooked and the species was not previously known east of Philip, South Dakota, though there is a record from Crawford County, Iowa. The insect is widely distributed over the Great Plains and records from east of central South Dakota, Nebraska, and Kansas are probably all relicts.

The species can be recognized by its great size (nearly to over two inches long), very robust form and round pad-like tegmina, these tegmina buffy marked with blackish brown spots. In the present key it would run to section H1.

To page 33. **Hypochlora alba** (Dodge)

Five males and 10 females, taken August 6 to September 30, 1932, are from Andover, Barnesville, Morris, and Browns Valley.

Barnesville is a new northern limit and Andover is a very considerable extension eastward of the known distribution of this Great Plains

species, which in southeastern Minnesota is certainly very local. Tinkham writes that it was there very rare, found on *Artemisia ludoviciana* in a sandy region with oak savanna type of vegetation where the dominant grass is *Stipa spartea.*

To page 33. **Hesperotettix viridis pratensis** Scudder

Seven males and 6 females, taken August 4 to 8, 1932, are from Andover, Santiago (in meadow), Barnesville, and Graceville.

Barnesville is a northern limit in this longitude.

To page 33. **Melanoplus gracilis** (Bruner)

Savage Trout Stream, Scott County, VIII, 13 and 14, 1932 (E. R. Tinkham), 9 ♂, 14 ♀, 2 juv.

To page 33. **Melanoplus viridipes viridipes** Scudder

Sunrise, Chisago County, VII, 15, 1932 (E. R. Tinkham), 1 ♂. St. Croix Springs, Chisago County, VII, 15, 1932 (E. R. Tinkham), 2 ♂, 1 ♀.

To page 34. **Melanoplus mancus islandicus** Blatchley

Poplar Lake, Cook County, VIII, 10, 1929 (W. C. Stehr), 1 ♂. Carlton, VII, 16, 1932 (E. R. Tinkham), 1 ♂. St. Croix Springs, Chisago County, VII, 15, 1932 (E. R. Tinkham), 1 ♂, 2 ♀.

The last locality is a slight extension southward of the known distribution of this race.

To page 34. **Melanoplus walshii** Scudder

Aitkin, VII, 17, 1932 (E. R. Tinkham), 1 ♂, 1 ♀.

This is a very slight extension northward of the known distribution of the species.

To page 36. **Melanoplus confusus** Scudder

North Branch, VI, 14, 1932 (H. L. Parten), 26 ♂, 12 ♀.

This is a very slight extension northward of the known range of the species.

To page 37. **Melanoplus borealis junius** (Dodge)

Carlton, VII, 15, 1932 (E. R. Tinkham; in muskeg), 2 ♀. International Falls, Koochiching County, VII, 15, 1932 (Winter and Aamodt), 1 ♂. Republic, VII, 30, 1932 (C. E. Mickel), 1 ♂.

These specimens are all typical of the present race.

To page 37. **Melanoplus bruneri** Scudder

International Falls, VII, 15 and VIII, 25, 1932 (Winter and Aamodt), 3 ♂, 4 ♀.

To page 39. **Melanoplus foedus foedus** Scudder

Battle Lake, VIII, 8, 1932 (E. R. Tinkham), 1 ♂. New Prairie, VIII, 5, 1932 (E. R. Tinkham; on gravelly hills), 5 ♂, 5 ♀.

This race was not previously known from Minnesota and these are eastern limital points.

To page 39. **Melanoplus foedus fluviatilis** Bruner

New Prairie, VIII, 5, 1932 (E. R. Tinkham; on gravelly hills), 1 ♂, 2 ♀.

This is a northern limital point. We had not expected to find this race in western Minnesota.

To page 40. **Melanoplus flavidus flavidus** Scudder

North Branch, VII, 17, 1932 (C. E. Mickel), 11 ♂, 14 ♀.

This is a northeastern limital point for the species.

To page 40. **Phoetaliotes nebrascensis** (Thomas)

Bradford, Isanti County, VIII, 4, 1932 (C. E. Mickel), 1 ♂. Andover, Anoka County, VIII, 4, 1932 (C. E. Mickel), 17 ♂, 6 ♀ (2 ♂, 2 ♀ macropterous). Randall, Morrison County, VIII, 8, 1932 (C. E. Mickel; in pasture), 1 ♂. Santiago, Sherburne County, VIII, 4, 1932 (E. R. Tinkham), 1 ♂, 2 ♀.

The present material shows that the species occurs across southern Minnesota. Bradford is a northern and eastern limit, Andover being another eastern limit in this latitude.

To page 41. **Scudderia curvicauda curvicauda** (DeGeer)

Bradford, Isanti County, VIII, 4, 1932 (E. R. Tinkham), 5 ♂, 1 ♀. Andover, Anoka County, VIII, 4, 1932 (E. R. Tinkham), 1 ♀.

These are the first correct definite Minnesota records for the species, indicating that it occurs over the southern portion of the state. It prefers oak foliage.

To page 42. **Amblycorypha oblongifolia** (DeGeer)

Red Wing, VIII, 8, 1932 (M. A. Thorfinson), 2 ♂.

To page 42. **Neoconocephalus robustus crepitans** (Scudder)

Sedan, IX, 1928 (D. G. Denning), 1 ♀ (light brown).

This individual is perfectly typical of the race, the record constituting a northwestern limit and a decided extension of its known distribution. It is probably this race which has been found in southeastern Minnesota, but material from that section must be seen before a definite decision can be reached.

To page 43. **Neoconocephalus ensiger** (Harris)

Eight males and 3 females, all green, taken July 16 to August 8, 1932, are from Wrenshall in Carlton County, Andover, Republic, Barnesville, and Morris.

Wrenshall and Barnesville are northern limits, showing that the species occurs over more than the southern half of Minnesota.

To page 43. **Orchelimum vulgare** Harris

Three males and two females, taken August 6 and 8, 1932, are from Breckenridge, Morris, and Alberta.

Breckenridge is a northern limit, that and Fairmount, North Dakota (a female before us), constituting western limits.

To page 44. **Orchelimum gladiator** Bruner

Forty-three males and 29 females, taken July 15 to August 8, 1932, are from Findlayson, Alma Lund, Sunrise Lake in Chisago County, Santiago, Stephen, Argyle, Warren, Barnesville, and Childs.

To page 44. **Conocephalus brevipennis** (Scudder)

Republic, Anoka County, VII, 30, 1932 (C. E. Mickel), 2 ♀.

This is a very slight extension northward of the species' known range.

To page 45. **Conocephalus strictus** (Scudder)

Seven males, 3 females, 9 immature males, and 15 immature females are from Andover, Newport, and Brown Valley.

Extension northward of the known range is shown by the Andover and Browns Valley records.

To page 45. **Conocephalus saltans** (Scudder)

Twenty-nine males and 20 females, all brachypterous, taken July 14 to August 8, 1932, are from Wrenshall, Bradford, Republic, Andover, Santiago, Newport, Stiles, Argyle, Barnesville, Almora, Browns Valley, and Morris.

Wrenshall and Argyle extend the distribution of this species far north of its previously known limits. In the wooded northeastern section of Minnesota it is probably extremely rare, very local, and confined to open spots of poor soil.

To page 46. **Anabrus simplex** Haldeman

We now have specimens of this species from Devils Lake, North Dakota, and Miller, South Dakota, indicating that the insect is present in the eastern portions of those states, there probably very local and scarce as is the case in extreme northwestern Minnesota, where only it has been found.

To page 48. **Ceuthophilus maculatus** (Harris)

Three males and 6 females taken August 8 to October 14, 1930 to 1932, and a large immature male taken June 20, 1932, are from Laporte, Plummer, St. Paul, and Dakota County.

To page 50. **Ceuthophilus latens** Scudder

Lake Pepin, VII, 9, 1932 (E. R. Tinkham), 1 ♀. Hennepin County, VII, 10, 1929 (C. T. Schmidt), 1 juv ♂.

To page 51. **Udeopsylla robusta** (Haldeman)

Breckenridge, VII, 21, 1932 (C. E. Mickel), 1 ♂. Madison, VII, 27, 1932 (L. Sheldon), 1 ♂.

To page 52. **Nemobius griseus griseus** E. M. Walker

Bradford, VIII, 4, 1932 (E. R. Tinkham), 1 ♂.

To page 53. **Oecanthus nigricornis quadripunctatus** Beutenmüller

Nine males, 2 females, and 5 immature individuals are from Bradford, Republic, Newport, Barnesville, and Morris.

To page 53. **Oecanthus nigricornis argentinus** Saussure

One male and 4 females are from Battle Lake, Almora, and Morris.

These are eastern limits, Battle Lake being also a northernmost point of distribution. Not known previously from Minnesota, this insect is very close to *nigricornis quadripunctatus;* differing only in having the markings on the proximal antennal joints heavy and confluent. It is as a rule less robust than *nigricornis nigricornis* with none of the dark suffusion of the antennae beyond the proximal joints, pronotum, and ventral surface of abdomen which often distinguish that insect.

To page 53. **Oecanthus nigricornis nigricornis** F. Walker

Five males and 9 females are from Bradford, Republic, Savage, Leech Lake near Federal Dam, Plummer, Barnesville, Childs, Chokio, and Graceville.

Leach Lake and Plummer give a considerable extension northward of the known distribution of this tree-cricket.

To page 54. **Tridactylus apicialis** Say

Enchanted Isle, Lake Minnetonka, VI, 26, 1932 (E. R. Tinkham), 1 ♀.

To page 54. **Tridactylus minutus** Scudder

Enchanted Isle, Lake Minnetonka, VI, 26, 1932 (Tinkham and Denning), 18 ♂, 35 ♀, 21 very small juv.

This is a northern limit and the first record for Minnesota.

Authentic records of the following species, which have been reported from Minnesota but which we have not been able to verify, are still greatly needed.

Stethophyma platyptera (Scudder). Found in rich grasses in wet spots and bogs.

Hippiscus rugosus (Scudder). Found in grasslands both east and west to the south.

Schistocerca lineata Scudder. Should be found in western Minnesota.

Melanoplus occidentalis occidentalis (Thomas). Western. Grasslands.

Conocephalus nemoralis (Scudder). Woodland undergrowth.

Oecanthus latipennis Riley. Prefers oaks.